MARINE REVIEW

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MASTERS AND PILOTS OF STEAM VESSELS.

Washington, Jan. 31—The annual meeting of the American Association of Masters and Pilots of Steam Vessels was held in Washington during the past week. Among resolutions adopted was one of a very urgent kind endorsing the Frye-Payne shipping bill. The committee on inspection service visited the board of supervising inspectors of steam vessels and brought to their attention the rule requiring the re-examination of all licensed officers of steamboats, and the board stated that they would take care of the matter, and assured the committee that the rule would not affect old practical men who still retained their faculties, and that the board would endeavor to amend the rule in such a manner as to be satisfactory to all licensed officers.

The committee on legislation visited the different committees in congress which have under consideration bills affecting the interests of pilots. The most important of these bills is the Daly bill to transfer the state pilotage system to the federal inspection service. This bill is determinedly opposed by the association. Assurances were received from the congressional committee that the bill would not be pushed during the present session. The bill to prohibit raft towing on the Pacific coast was indorsed, and an endeavor will be made to have it passed during the present session. A most earnest indorsement was given to the bill to provide for the establishment of a marine hospital at Buffalo. It is quite likely that congress will appropriate funds for this hospital during the present session. The smoke nuisance at the Bayonne Kilns in New York harbor was the subject of lengthy discussion. It was represented to the New York delegation in congress that the smoke frequently lies so low and so thick upon the water as to be more impenetrable than fog. The delegation promised to see what legislation could do to remedy the matter.

The following representatives were present at the session: William De Graff, Harbor No. 1; John T. Fowler, No. 2; William S. Van Keuren, No. 3; Luther B. Dow, No. 5; Thomas B. Luther, No. 6; Ulster Davis, No. 7; William Miers, No. 9; A. W. Halsey, No. 10; J. W. Cann, No. 11; M. L. Spedden, No. 14; James T. Gray, No. 23; J. A. Clow, No. 25; Ben M. Mirrialees, No. 26; C. C. Townsend, No. 29; Joshua Davis, No. 30; John R. Sutton, No. 31; M. P. Usena, No. 36; Joseph W. Davis, No. 38; Richard M. Lamphier, No. 43; Egbert Doville, No. 43; Walter J. Green, No. 44; James W. Montgomery, No. 46. There are forty-seven harbors altogether in the association. Those for which delegates names are not given in the foregoing list were represented by proxies.

The association now extends from the Atlantic to the Pacific and from the lakes to the gulf. Its membership has increased by several hundreds during the past year and its condition is quite prosperous. The influence of the association is far reaching and it has demonstrated to the vessel owners that its efforts are as much for their interests as for the interests of the employes.

The following officers were elected for the ensuing year; Grand captain, John C. Silva, harbor No. 13, Providence, R. I.; grand first pilot, John T. Fowler, harbor No. 2, Camden, N. J.; grand second pilot, Ben M. Mirriales, harbor No. 26, Cincinnati; grand purser and counsel for the association, Luther B. Dow, harbor No. 5, Brooklyn; grand captain's clerk, Ben F. Perkins, harbor No. 6, Jersey city. The next meeting of the association will be held in Washington in January, 1901.

DEATH OF CHARLES R. JONES.

Charles R. Jones, one of the young men among Cleveland vessel owners, died very suddenly on Sunday last of pneumonia. The announcement was the cause of great sorrow in vessel circles, as it was known that Mrs. Jones died only a short time ago, leaving three children, all boys and the oldest only about nine years of age. It is fortunate, however, that the children are quite well provided for and will have the care of relatives who are very much interested in them. Charles R. Jones was the son of the late Capt. J. M. Jones, who was among the pioneer ship builders of the lakes, and who spent the latter years of his life in Detroit. While his father was engaged in vessel brokerage business in Detroit, about ten or twelve years ago, Charles returned from service in the navy, where he had secured a training that was of advantage to him in vessel business. He spent a short time in his father's office and then concluded to open a vessel agency in Cleveland. Beginning moderately with the smaller class of lumber carriers, he gradually secured interests in several vessels and was quite prosperous. During the dull period of two or three years ago he bought the control of half a dozen or more medium-size carriers that were offered at low figures, and with a very promising year ahead he was in position to reap the advantages of several years of hard work when death came entirely unexpected.

ANOTHER ST. LAWRENCE FEEDER.

Hon. J. I. Tarte, minister of public works in Canada, is thus quoted relative to the proposition to make French river navigable so as to bring great lake steamers, carrying products of the grain fields of the northwest, from Fort William to North Bay, on the Canadian Pacific railway:

"I have been giving attention to this matter for several months; so much so that I will ask my colleagues to allow me to place in the estimates a pretty large amount of money to improve the French river from its mouth on Georgian bay to Lake Nipissing. The distance is about fifty miles. It is already a navigable river, and we will only have to improve parts of it to make it a first-class waterway for ships drawing 18 feet. We will require to build dams and three locks and the balance of the work will be dredging. Just look at the facts. Up to this day the Canadian Pacific Railway has carried our Canadian wheat to Fort William, where it has been left to its fate, or in other words, has been taken by American barges to Buffalo. Out of ten bushels of Canadian grain I do not think I am exaggerating in saying that nine have gone to American ports. All that will be changed by the project we have now in hand. The distance from Fort William to North bay is 650 miles. From North bay to Montreal it is 360 miles. The Canadian Pacific will undertake to carry with a fleet of their own our Canadian grain from Fort William to North bay, where it will be transhipped to Canadian Pacific cars en route to Montreal. In other words, the Canadian Pacific will do what the Canadian Atlantic Railway is now doing from Parry sound. If this enterprise is carried out, as I have no doubt it will be, it will bring 25,000,000 to 30,000,000 bushels of Canadian grain to the St. Lawrence route and to the port of Montreal. Of course, the port of Montreal has to be equipped speedily, and that is the reason why I have been urging so strongly on the harbor commissioners to go ahead."

"Has the government any intention of going on with the works at Montreal?"

"Most decidedly we have. I am now in communication with the harbor commissioners. There are now $500,000 in the estimates of my department for carrying out the works in the eastern portion of the harbor, where the Canadian Pacific will locate themselves more and more. You will understand that there must be considerable improvements at the port of Montreal, but it must also be borne in mind that it is not a Montreal question, but interests nearly everybody in the dominion, farmers, merchants, manufacturers, and, in a word, all who use transportations."

CRAMP CLAIM REFERRED.

The committee on claims of the United States senate has recommended the passage of the bill to refer the claim of the William Cramp & Sons Co. of Philadelphia, to the court of claims. By an act passed June 30, 1897, the secretary of the navy was directed to examine claims against the government which might be presented by contractors for naval vessels completed since Jan. 1, 1891, if the claim was made that losses entailed were due to delays occasioned by the government. Under authority of this law the William Cramp & Sons Ship & Engine Building Co. presented claims against the government to the secretary of the navy for loss and damage due to delays alleged to have been caused by the government in the construction of the New York, the Columbia, the Massachusetts and the Indiana. In each case it is alleged by the contractors that the delays complained of were due to the failure of the government to supply the armor or other materials in accordance with the several contracts under which these ships were constructed, and in the case of the New York further delay occurred by reason of the changes authorized by the department in the plans and specifications. Claims on each of the several vessels is as follows: New York, $211,018.31; Columbia, $192,235.79; Massachusetts, $483,757.49; Indiana, $480,231.90.

The committee has also presented a favorable report on the bill for the relief of the owner of the schooner Bergen. The owner of the Bergen makes the claim that she was sunk by collision with the United States steamer Periwinkle at the mouth of the Potomac river on the night of Jan. 18, 1865, and proved a total loss. He further claims that the lights of the schooner were burning and that the collision was due entirely to the negligence of the officers of the Periwinkle.

LARGE SHIP BUILDING PROJECT.

A story from Philadelphia this week is to the effect that Mr. H. C. Frick has secured control of the ship building plant now being erected at Camden, N. J. by the New York Ship Building Co., of which Mr. Henry G. Morse is president. According to the report the gentlemen with Mr. Frick at an all-night conference at the Hotel Walton, where the deal is said to have been closed, were Andrew W. Mellon, the Pittsburg banker, Henry Phipps, H. L. Shaffer, J. M. Shoemaker, Mr. McCook and Jay Phipps of New York, and Mr. Henry G. Morse. It was decided, so the story goes, to increase the capital of the company from $5,000,000 to $10,000,000, and to work in harmony with the new Union company, a new steel concern with which Mr. Frick is also said to be connected. There is, of course, nothing official about these reports.

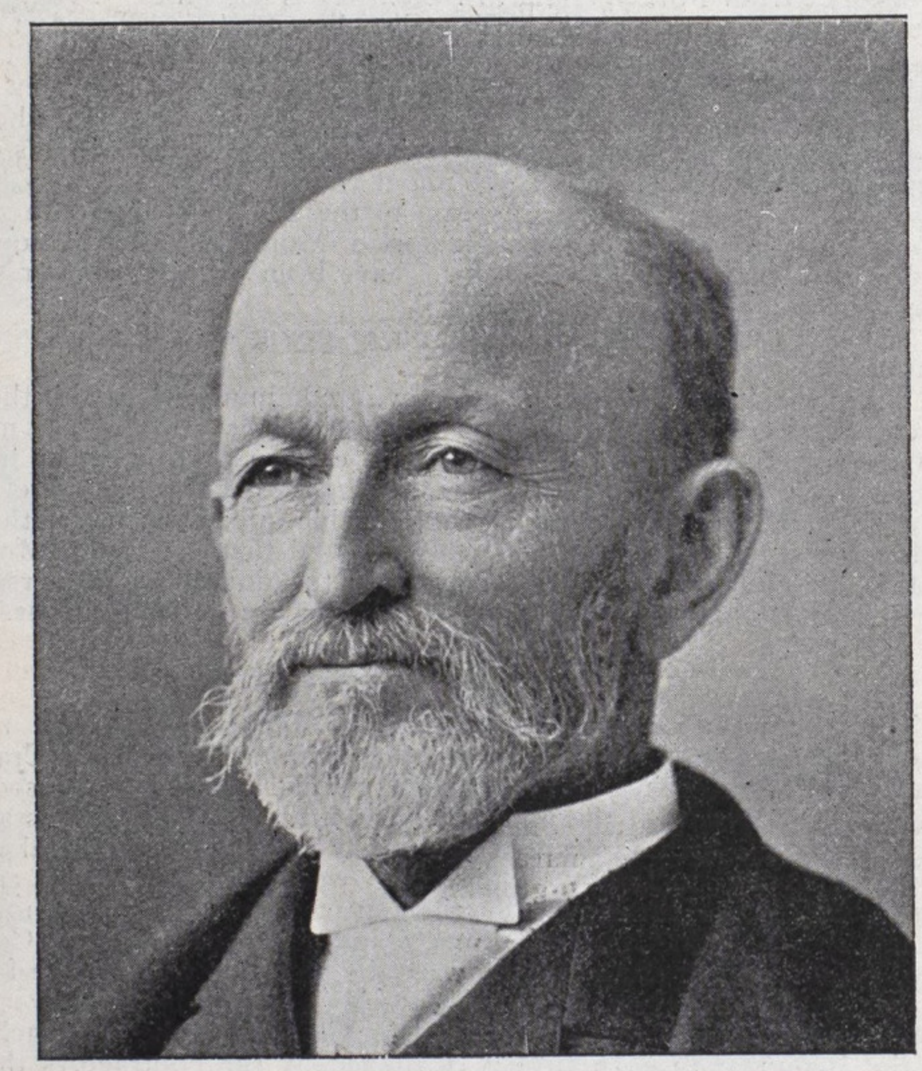
The most stupendous naval project proposed by any of the powers in some time will shortly come up in the French chamber of deputies. It contemplates an expenditure of $150,000,000, $100,000,000 of which is to be devoted to a reorganization of the fleet. The report recommending this great expenditure is most enthusiastic in endorsement of the submarine torpedo boat Holland and states that the government will immediately build two and hopes ultimately to have a whole fleet of these novel vessels.

OUR STEEL INDUSTRY.

ITS WONDERFUL DEVELOPMENT AND RELATION TO SHIP BUILDING—ENGLISH AND GERMAN SHIP YARDS MUST EVENTUALLY COME TO THE UNITED STATES FOR RAW MATERIAL—GERMANY WILL EQUAL GREAT BRITAIN AS A MARITIME POWER—ULTIMATE EFFECT UPON THE GENERAL WEALTH OF THE UNITED STATES IS INCALCULABLE.

BY CHARLES H. CRAMP.

It seems fashionable in many quarters to describe the existing activity in the iron and steel industries of the United States and in their accessory or contributory industries as "a boom." This term, though in the commonest use and of universal application, is not clearly defined, but in the main it seems to be employed for the purpose of producing the impression that any state of things to which it is applied as a descriptive must be considered temporary, or not based upon sound and enduring trade laws and business principles. From this point of view the term is not properly applicable to the state of the industries under consideration. The growth of facilities and expansion of productivity have been rapid in the past few years, but they have also been steady and without the least symptom of the spasmodic or the abnormal. With this phase of the situation questions of price from time to time have nothing to do. The main, in fact, the sole element to be considered in a survey of such industrial conditions is that of volume, and the lesson to be drawn from such survey is its relation to the general welfare and commercial supremacy of the country as a whole. Such growth of facilities and such expansion of output capacity are brought about and governed by economic laws wholly distinct from those which regulate prices, and the two elements



CHARLES H. CRAMP.

must be carefully and constantly kept in separate view, and in considering the significance of the volume an effort to associate with it consideration of prices for the time being would only produce confusion.

With this explanation I shall proceed to deal wholly with the affair or volume, and with the unavoidable deductions as to its bearing upon the industrial, commercial, and financial relations between this country and the rest of the world. The statistics of iron and steel production and of the correlative output of ore, coal and coke exhibit that the United States began to range up alongside of Great Britain in 1889; that between that year and 1896 there was a close race, with sometimes one and sometimes the other slightly in the lead; that in 1897 the United States passed Great Britain by a million tons in output of pig iron, and that in 1898 the lead was by 2,500,000 tons in favor of the United States, the totals for that year being 11,773,000 tons for this country as against 9,342,000 tons for Great Britain. The output of the United States for the first half of 1899 was 6,289,000 tons, which indicates a total for the year of about 12,500,000 tons. Complete British statistics for the first half of 1899 are not accessible, but enough is known to justify an estimate for the whole year but little if any in excess of 1898—say, 9,500,000 tons. This would put the United States in the lead for the year 1899 by the enormous amount of 3,000,000 tons, or a ratio of excess over Great Britain equal to 31½ per cent. This lead can never be broken. The economic laws that produced it must continue to operate, and their operation must tend always to widen the gap, never to close or even lessen it.

ENGLAND PERMANENTLY RELEGATED TO SECOND PLACE.

For several years Prof. Goldwin Smith has periodically announced the attainment by England of her climax as the supreme power among nations. Various causes have from time to time operated to postpone the actual verification of the professor's theory; and it is within the range of possibility that the iron and steel product for 1898 or 1899 may be slightly exceeded in the future. Be this as it may, one element at least of Prof. Smith's doleful prophecy has at last become an established fact, namely, that England has been, by the advance of the United States, permanently relegated to the second place as a producer of iron and steel. It will, I think, be conceded without argument that the production of iron and steel is, under modern conditions, the basic industry of all, and that the tendency in every direction is to emphasize that fact more and more year by year. It is not necessary to adduce particulars in verification of this great fact. Suffice to say that all traffic by land is now done on steel roads, all traffic by sea in steel ships, all fabrics are made by steel and iron machines, and that the affairs of industry and commerce are day by day more and more transacted in steel buildings. From this point of view, and without minifying the importance of any other industry, it is not too much to say that the capacity to produce iron and steel has become the gauge or standard of national supremacy; and that the fixity or permanency of that standard is already settled beyond peradventure.

Having seen that the United States stands at the head of nations in the primary industry of modern civilization, and that no possible combination of events can ever disturb that supremacy, we may now turn briefly to considerations of the components or the natural bases of that supremacy in the raw or primary condition. The foundation of steel and iron production is, of course, coal and iron ore. In the case of the United States to coal may be added, to limited extent, however, and thus far quite localized, natural gas. However, for general purposes it is worth while to consider only the two prime elements, coal and iron ore; and in this connection the coal element must be limited to the kind of that material suitable for coking or gas producing. The total area of British coal fields, and it may be said that there is no undeveloped coal area remaining in Great Britain, is 9,300 square miles; all the British coal area, or, at least so nearly all that the residue is not worth mentioning, is suitable for coking or gas producing; particularly in view of the latest approved processes known as the Otto-Hoffman and the Semit-Solvay.

COAL AREA OF UNITED STATES.

The grand total coal area of the United States, exclusive of Alaska, is 197,000 square miles. This means only the areas where coal has actually been developed by sinking shafts in greater or less number in each coal belt. But of this vast area not all is susceptible of the uses of iron and steel production. The United States geological survey gives 1,700 as the square mileage of anthracite coal fields of Pennsylvania, which, of course, must be excluded. A great part of the far western coal areas may also be excluded from the iron and steel making category, the coal deposits in that region being forms of lignite in greater or less stages of development, but not up to the point of coking or gas producing. Making the most liberal allowances for all these deductions, it is sufficient for the purpose of this paper to say that the coal area of the United States known and developed wholly or in part which bear coking or gas producing coal is considerably more than 70,000 square miles. The vertical extent, or, in other words, the depth of these deposits as compared with those of Great Britain, are at this time indeterminable for the reasons that they have nowhere been worked to the point of exhaustion or driven to such depths as to render the hoisting of the product nearly or quite unprofitable, which is beginning to be the case in certain parts of the British coal fields. On the whole, it is safe to say that the coking or gas producing areas of the United States are to those of Great Britain at least in the ratio of 8 to 1, and all the probabilities of future development point to a considerable augmentation of this ratio in favor of the United States without taking account of the possibilities of vertical exhaustion. We now come naturally to the other element involved, that is to say, iron ore.

THE IRON ORE ELEMENT.

In 1898 Great Britain consumed in round figures 18,000,000 tons of iron ore, of which one-third was imported, the exact figures being 5,988,000 tons. The prime importance of this very large importation and of the ratio which it bears to the total amount of ore used in Great Britain during the year selected as an example is that it represents or expresses the fact that the indigenous ores of Great Britain are not in the highest degree or in any considerable quantity suitable for the production of mild steel; therefore, in the present state, and under existing requirements of steel production, Great Britain has within her own area only the single element of coal. On the contrary, the United States possesses in what is known as the "lake regions" apparently inexhaustible supplies of the most perfect Bessemer, or, in other words, steel-producing ores, in the known world. To these resources may be added the extensive fields of Cuban ore, the quality of which is quite equal to that of any of the Southern European or African ores which England uses. And the Cuban ores may be said to lie at our very doors, if not within our own area, a question at this time rather of politics than economics.

The foregoing general resume of primary conditions may serve to indicate the basic or fundamental reason for the attainment by the United States of the absolute and irreversible supremacy over Great Britain as an iron and steel producing power.

FINANCIAL AND INDUSTRIAL CONDITIONS INVOLVED.

We may now, partly for the purpose of an interesting illustration and partly to lay foundation for comment farther along upon the financial and industrial conditions necessarily involved, call attention to the fact that the state of Pennsylvania, representing mainly one-sixty-sixth of the area and one-thirteenth of the total population of the United States, has ever since the year 1892 produced more than one-half of the entire output of American pig iron, nearly three-fourths of the output of all kinds of steel ingots and castings in the United States, more than three-fifths of the total output of Bessemer steel rails and between one-half and four-sevenths of all kinds of railroad iron and steel in finished forms. During the same period Pennsylvania has produced in the annual average nine-seventeenths of all the coal mined in the United States, and in round figures a little over two-thirds of all the coke made in America.

To this exhibit it only remains to be added by way of showing the relative progress during the seven years taken as a basis of consideration that the production of pig iron in Pennsylvania has grown from a minimum of 3,370,000 tons to a maximum in 1898 of 5,537,000; the production of steel ingots and castings from a minimum of 2,979,000 tons to a maximum of 5,289,000; the production of steel rails from a minimum of 714,935 to a maximum of 1,053,000; the production of all kinds of railroad iron and steel in finished form from a minimum of 2,719,000 tons to a

maximum of 4,622,000, in 1898; the production of coal from a minimum of 91,833,000 to a maximum of 118,547,000 tons in 1898, and of coke from a minimum of 6,063,000 tons to a maximum of 10,715,000 in 1898.

This extraordinary progress has required, or, rather, has compelled a tendency to concentration of capital and combination of management. It could not have been accomplished in any other way. The quantities dealt with are so vast, and the appliances necessary to handle them are so intricate and costly, and the average margin between cost of production and market price so narrow that individual capital and management have been either driven out of the field or forced into combination and concentration by the law of self-preservation. Under such circumstances the question for the people—the general public—to consider is not whether this tendency to concentration and consolidation is an evil; not whether it can be judged from the point of view of prior or more primitive conditions, but whether it is not the infallible result or effect of fundamental economic laws over which neither public sentiment nor legislation of any kind can exercise the slightest control. This, we think, is the true point of view from which all great developments should be considered.

THE SHIP BUILDING INDUSTRY.

We now come to consider the relation of ship building to the development and expansion of the iron and steel industry above pointed out. Under modern conditions ship building is one of the principal channels for utilization of the iron and steel output. While it is not the most considerable of such channels in the sense of mere volume of tonnage, its relation to the sum total of prosperity and of national prestige and power as well, give it a status of chief importance in quality if not in quantity. Whatever may be the development and expansion of American iron and steel manufacture, and however permanent may be its supremacy over that of any other nation, its best and most far-reaching result cannot be realized without a correlative development and expansion of ship building. At the present moment the last named industry has not kept pace in its advancement with the general progress of iron and steel making. But this is no reason why such a disparity should continue to exist, and it will not exist very long provided that the advantages which foreign rivals have hitherto had over us in that particular shall be met and overcome as has been the case with iron and steel.

Without going into elaborate analysis of this question in its various bearings and details, we may at once present an object lesson. On Jan. 10, 1900, a new vessel for the Hamburg-American Steamship Co.—called the Deutschland—was launched at the Vulcan yard, at Stettin. This, up to date, is one of the largest two ships in the world. The other ship which alone can be compared with it is a British production; but the British-built ship is, in size at least, the culmination of the efforts and training of the primary industry of Great Britain; an industry which has always been the leading one in that country; an industry upon which it may be said the whole burden of the British empire rests. The German ship on the contrary represents to all intents and purposes a culmination of the development of the ship building art whose beginning does not date back in any sense of the word worth mentioning more than twenty years, and the chief importance of whose growth has been within twelve.

When this vessel was launched, the imperial German minister of foreign affairs, von Bulow, made some remarks which have been reported in the American papers. Without pretending to quote them verbatim, the substance of the German minister's remarks was to the effect that this tremendous stride of progress was due to the reawakening of German industry and of German aspirations toward foreign commerce, caused, first, by the consolidation of the empire into a single state, and secondly, though quite equal in importance, to the wise and steadfast policy which the newly consolidated German states have for several years maintained toward the promotion of ship building and ship owning under the German flag. This policy, in brief, is to grant special privileges and subventions to ships navigated and operated under the German flag that have been built in Germany, and refusing such benefits to ships that may be operated under the German flag that have been built in foreign ship yards.

Up to 1887, although there was a considerable tonnage operating under the German flag, mainly in the Hamburg-American and the North German Lloyd lines, all their ships worth mentioning were British-built, and even when the Germans first began to build their own important ships, the pioneers of which were the Spree and the Havel, these were little more than imitations, not to say duplicates, of the latest ships that had been built for them in British ship yards. The Spree and Havel entered on the north Atlantic traffic in 1890, and they had been about two years building in the Vulcan ship yard at Stettin.

PROGRESS OF GERMAN SHIP BUILDING.

To trace the progress of German ship building from the laying of the keels of the Spree and the Havel to the launch of the Deutschland is not necessary for the purpose of this paper. Suffice to say that during that period, which is not more than twelve years, the development and expansion of German ship building may be gauged by the volume of work in hand in the year 1899. Thus we may summarize briefly during the year 1899 the North German Lloyd Co. had under construction ten ships aggregating 85,000 tons gross register, of which only one ship of 7,500 tons was building in England; the other nine ships, representing 77,500, were building as follows: Two by the Vulcan company at Stettin, two by the Vulcan company at Bremen, one by Schichau at Dantsic, two by Blohm & Voss at Hamburg, and two by John C. Tecklenborg at Geestemunde. During the same period, that is to say, the year 1899, the Hamburg-American Co. had fourteen ships in various stages of construction, aggregating 148,000 registered tons. Of these the Deutschland, just previously described, was the largest.

This brief resume of the difference between German ship building immediately prior to 1890 and immediately prior to the year 1900 would seem to indicate the advance that has been made more clearly and more forcibly than a more extended or detailed description could do. However remarkable as the growth in volume of German ship building has been in the ten or twelve years under consideration, the increase in the size of the individual ships constructed has been, if possible, even more striking. Whatever merit there may be in the vast increase in the size of ships, Germany is primarily entitled to it because her ship yards have thus far built a greater number of extremely large vessels than the ship yards of even Great Britain itself, and the Germans were also the pioneers in the development of the freight ship of extraordinary size. The English have, indeed, to a certain extent, followed the German lead, but only during about the last half of the decade under consideration.

BRITISH SHIP BUILDING.

The expansion in size of ships observed in British ship building may be illustrated by calling attention to the output of one of the principal British ship yards. For example, in the year 1896 the output of Harland & Wolff, Belfast, was thirteen ships of 81,316 tons altogether. In 1899 the output of the same ship yard was seven ships of 82,634 tons, almost doubling the size of ships within a period of four years inclusive. The tendency of other ship yards, such as Palmers, of Jarrow; John Brown & Co., Limited, of Clydebank; Swan & Hunter, Wallsend; Fairfield, of Govan, and others of less importance, are in the same direction, though not equally pronounced.

The table before us, which is the annual ship building return compiled for the years 1896, 1897, 1898, and 1899, and published in the Syren and Shipping of December 20, 1899, embraces a total of 126 different ship yards in Great Britain, from the greatest to the smallest, but all engaged in the construction to a greater or less extent of sea-going vessels. The extent of this list serves to exhibit more forcibly than anything else could the relation of ship building to other industries in Great Britain and also its comparative relation to the ship building of other countries. We have seen that Germany, with practically only six ship yards capable of first-class work, namely, the Vulcan works, at Stettin; Schichau's new ship yard, at Dantsic; Krupp's Germania yard, at Kiel; Blohm & Voss, at Hamburg, and the Vulcan company and Tecklenborg, at Geestemunde, has actually for the past ten years set the pace in ship building progress and expansion for England to follow, with her 126 ship yards.

The English take great pains, through every channel of utterance, to make the world believe that they do nothing to encourage their own ship building; that it is purely and naturally the result of their condition and the genius of their people. The Germans, on the other hand, through the voice of their minister of foreign affairs, proclaim to the world that they aid, encourage, and promote ship building and ship owning by a policy of encouragement and subvention to ships built in German ship yards. Granting for the sake of argument that the English in disclaiming aid to their shipping are as sincere or as truthful as the Germans are in proclaiming that they do aid theirs, the comparative progress of the two nations in the last ten years, as above shown, would seem to preclude the necessity of further argument.

COMPETITION BETWEEN NATIONS.

There is one other element to be brought out in this discussion, and that is the fact that competition in ship building during the past ten years—a competition which has been between nations as much as between different ship builders belonging to each nation—has produced a tendency analogous to that previously mentioned as pertaining to the production of iron and steel—that is to say, the necessity for consolidation of capital and concentration of energy, effort, skill, and experience. The important ships of the current period cannot be built in small ship yards. The ship yards in which they are built and the appliances and organizations which operate in their construction must be enlarged and expanded and developed in proportion to the increased size, massiveness, and complexity of their product. The tendency growing out of this essential and unavoidable fact is to force the elements of the ship building industry—capital, skill, energy and experience—into combinations relatively as much greater than the small shipyard of the past, which built small ships, as the ships of the present period are greater than those which they are rapidly superseding. Above all other things, this development involves to a crucial degree the survival of the fittest in the headship of these vast aggregations of personnel made necessary by the conditions above pointed out. This relates to the problems of capacity in design, executive ability, and financial acumen—in short, to the personal equation in all its aspects.

In Great Britain, France and Germany this tendency has not manifested itself merely in the consolidation of ship yards, but in combinations between ship yards and their contributory industries. As for example: Armstrong, Mitchell & Co.'s ship yards at Newcastle have absorbed the great Whitworth Steel Works at Manchester: the great steel works of Vickers Sons, of Sheffield, have absorbed the Barrow Ship Building Co. at Barrow-Furness; John Brown & Co., for many years among the leading steel and armor makers of England, have absorbed the Clydebank Ship Building Co., formerly operated by Messrs. J. & G. Thomson. There have been also other similar consolidations in England of ship building with contributory industries, but these are of minor importance. In France the greatest of all French ship yards, the Forges et Chautiers de la Mediterranee at La Seyne, has effected a consolidation with the largest steel manufactory of that country, the Schneider Works at Le Creusot. In Germany the Krupp Steel Works at Essen have absorbed the Germania Ship Yard at Kiel and are understood to be negotiating for the similar absorption of one of the two yards at Bremerhaven and Geestemunde.

It therefore appears that modern conditions have produced upon the ship building industry a necessity quite analogous to that already pointed out as the natural result of the great growth of the iron and steel industry, and it is fair to assume that the latter is quite as much in obedience to an irresistible law as the former. In conclusion, it remains only to be said that the established supremacy of the United States as an iron and steel producer must bring the English and German ship yards to the United States as customers for raw material. This will increase the advantage of Germany over Great Britain more and more as each nation becomes more and more dependent upon the United States for raw material: so that ultimately and not far distant the situation thus brought into effect will promote the realization of the ambition so often expressed by the German emperor of making Germany at least equal to Great Britain as a maritime power, and whatever these effects may be in these directions their ultimate effect upon the general wealth of the United States must be incalculable.

REPORT AGAINST HOLLAND.

WHY NAVAL BOARD OF CONSTRUCTION REFUSED TO RECOMMEND PURCHASE OF THE SUBMARINE BOAT—TRIALS OF THE ENGLISH-BUILT CRUISER ALBANY—OTHER NAVAL MATTERS.

WASHINGTON OFFICE OF THE MARINE REVIEW, 1345 PENNSYLVANIA AVE.
WASHINGTON, D. C., January 31, 1900.

As announced in the Review last week the naval board of construction has declined to recommend the purchase of the submarine boat Holland. A minority report is submitted by Rear Admiral Hichborn, chief of the bureau of construction and repair, who is favorable to the purchase of the Holland. The action of the board is based on the proposition from the Holland Torpedo Boat Co. to sell the Holland to the government for $170,000, or with certain modifications for $165,000, or to build two new or larger boats in accordance with plans submitted by the company for $170,000. The majority report says:

"The board does not recommend the purchase of the Holland, and in view of the fact that the Holland Torpedo Boat Co. is now a delinquent in the case of the submarine boat Plunger under its contract with the department of March 12, 1895, by the terms of which she was to be completed in twelve months, it is of opinion that no further contract should be awarded to said company until some settlement satisfactory to the department has been made concerning the Plunger, on account of which the government has already paid the sum of $99,716.50 and there appears to be no likelihood of her completion in the near future."

The majority report adds that if the company makes a satisfactory settlement in relation to the Plunger it considers that the department would be justified in entering into contract with the Holland company, under proper guarantees and specifications, for one submarine boat of the larger type offered by the company in its proposal. "As the company offers in its proposition herewith larger, faster and better boats than the Holland," says the majority report, "for the same price as it offers to sell the modified Holland, it seems a poor business transaction from any point of view to consider her purchase. Again, as the two new boats which the company offers to build are alike, the majority sees no good reason for contracting for more than one, as they can only be regarded as steps in development of the art of submarine navigation, for which purpose one boat is as good as two of like kind."

Rear Admiral Hichborn thinks that the majority report does not give sufficient credit to the Holland company for its enterprise. He thinks that the company ought to be encouraged and therefore submits a minority report in which he says: "In my opinion the reasons given by the company for the construction of the Holland are substantially correct; that is, having been satisfied that the design of the Plunger could be very materially improved upon, the company proceeded at its own expense to experiment with another boat, attaining results which, according to official reports and my own observation, are very satisfactory and entirely creditable. In view of all the facts, therefore, I believe that the department would be fully warranted in contracting for two boats of the Holland type, the Holland in itself being acceptable in my opinion, although less desirable than the proposed boats of slightly greater dimensions. The immediate possession of the Holland, however, in the event of a sudden emergency is to be considered an advantage. The fact of our having possession of the Holland in her present state of efficiency in the spring of 1898 would have been very marked in its effect."

TRIAL OF THE CRUISER ALBANY.

The following extract is made from a mail report to the navy department regarding the trial of the Albany at sea about six weeks ago: "On Jan. 9 the measured mile trials were held—four runs with natural draft and four runs with forced draft. On January 11 the six hours' continuous run with natural draft took place; 3-inch pressure was shown; the course was three hours out to sea from the mouth of the Tyne and three hours back. The performance of machinery and boilers on both days gave perfect satisfaction to the makers, Hawthorne, Leslie & Co. and to the ship contractors, both of whom were represented on board by their leading engineering experts. I have no doubt myself that the ship can readily make 21 knots, as the fire room and engine room force on board took the work very easily and quietly and steam was blowing off almost continually during the forced draft runs. So easily were the results obtained that the contractors offered to show me 21 knots for the forced draft runs for a bonus of 1,000 pounds. The engine rooms and dynamo rooms were cool and entirely comfortable. On the first day's trials a stiff offshore breeze caused the projections on the exterior of the ship to throw much water and made the waist and forecastle very wet. The ship was entirely steady. On the second day there was a heavy swell from northeast, which was taken head on for the first half of the run. An occasional moderate pitch—never enough to take solid water over the bows—and a very easy roll when turning were shown. The wind was light, making no whitecaps and the waist was dry. Vessels in sight were showing very much more motion than the Albany. Vibrations from screws was considerable in the captain's cabin, but outside of that neither the screws nor the engines were particularly noticeable."

Interest in the subject of sheathing the new battleships continues. Rear Admiral Hichborn takes considerable satisfaction in the report which Chief Carpenter P. T. Mager, who was on duty at Hong Kong under Naval Constructor Hobson, has made regarding the accident to the H. M. S. Bonaventure, which in the Yellow sea ran in between two pinnacle rocks, while steaming at 14 knots, with such fearful force that she raised her bows nearly 10 feet out of the water. "Fortunately," says the report, "she was sheathed with 4 inches of teak and copper. She was towed off by a couple of her sister ships and the damage was so slight, comparatively, that they were able to get her to Nagasaki, Japan, nearly 1,000 miles away, where they gave her some slight repairs. She then proceeded to Hong Kong, a distance of about 1,600 miles under her own steam. I examined the damage done and it was really wonderful, when you take into account the force with which she was struck, to see how small the damage was. In the short space of six weeks she was out of the dock and in good condition."

ATLANTIC PASSENGER TRAFFIC.

A total of 826 entries were made at the port of New York during 1899 by transatlantic steamers carrying passengers. From these vessels, arriving as they did on an average of sixteen per week, there landed 107,415 cabin and 303,762 steerage passengers, a total of 411,177. This aggregate represents an increase of 110,000 over 1898 and 128,000 over 1897—indeed it breaks all records since 1893. The following table makes apparent at a glance the fluctuation during several years past:

Year.	Number of Passages.	Cabin.	Steerage.	Total.
1890	.....	144,178	371,593	515,771
1891	.....	150,023	445,290	595,313
1892	.....	120,991	388,486	509,477
1893	975	121,829	364,700	486,529
1894	879	92,561	188,164	280,725
1895	792	96,558	258,560	355,118
1896	853	99,223	252,350	351,573
1897	901	90,932	192,004	282,936
1898	812	80,586	219,651	300,237
1899	826	107,415	303,762	411,177

It is noteworthy that the American line steamers have for three or four years past carried the most first-class passengers per ship, save in 1898, when several of the vessels were withdrawn for war service. The number this year was 313. The Cunard came next with 307 average cabin passengers; the White Star third with 223; Anchor line, 182; North German Lloyd, 179, Hamburg-American, 172; French line, 113; and Red Star line, 83. For the past year the highest average number of cabin and steerage passengers combined in first-class liners is to the record of the North German Lloyd, who add to their 179 cabin passengers, 541 steerage, making an average of 720. Following this is the White Star with 665; Cunard, 643; Hamburg-American, 636; American, 559; French line, 537; Red Star line, 483; and Anchor line, 344. The totals of the various companies during the past three years are indicated in the following table:

RETURN OF PASSENGERS LANDED AT NEW YORK BY PRINCIPAL COMPANIES.

Line.	1899.		1898.		1897.	
	Cabin.	Steerage.	Cabin.	Steerage.	Cabin.	Steerage.
North German Lloyd.....	19,994	75,291	17,895	53,223	15,196	40,415
Cunard.....	19,045	20,853	16,692	20,463	15,196	17,303
Hamburg-American.....	14,534	40,598	8,486	24,245	10,866	17,323
American.....	14,398	11,341	5,037	5,819	14,443	11,322
White Star.....	12,741	25,208	10,332	20,764	10,104	19,271
French.....	6,124	22,883	5,203	15,511	6,044	14,264
Anchor (Glasgow).....	6,196	19,296	5,099	19,765	6,478	19,372
Red Star (Antwerp).....	4,315	20,120	3,881	11,984	4,493	10,557
Holland-America.....	4,145	18,111	3,365	14,273	2,871	10,503
Allan-State (Glasgow).....	1,647	1,247	1,344	1,128	1,823	1,050
Atlantic Transport (London).....	2,657	.....	1,872	.....	1,820	.....
Thingvalla (Copenhagen)	752	3,465	679	2,661	860	3,201
Prince (Mediterranean)..	251	14,244	241	13,587	11	1,010
Fabre (Mediterranean)...	35	14,104	7	12,138	22	11,374
Empreza (Lisbon)..... ..	140	1,369	118	925	126	958
Portuguese (Oporto).....	80	1,515	55	667	71	877

AGAINST COALING STATIONS.

Rear Admiral Philip Hichborn, chief constructor of the navy, will declare himself officially against the proposed coaling station system of the government. This expression of opinion will probably be given to the house naval committee when the chief constructor appears before that committee. He believes that specially designed colliers should be built with a view to coaling at sea and he will suggest the innovation that instead of a naval ship towing the collier, while the former is being coaled under way, the collier tow the naval vessel, consuming its own store of fuel and preserving that of the warship. This appears to be an advantage over the system which was recently tested. Rear Admiral Hichborn believes that the coaling station idea is sufficiently meritorious in time of peace, but in time of war it furnishes, he thinks, an additional point of attack by an enemy against whom remote stations must be guarded. The matter of transporting fuel to these stations, he maintains, adds to the cost of the naval establishment without any adequate returns. Coal can be had in almost any quarter of the globe in time of peace and in time of war he believes that the only system for recoaling ships will be that by means of the colliers. The latter can be so constructed as to tow instead of being towed, and, being equipped with towing machines, they can handle large ships without danger of hawsers parting and other accidents.—Army & Navy Register.

Mr. Wm. L. E. Mahon, formerly with S. F. Hodge & Co. and the Frontier Iron Works, well known marine engineering concerns of Detroit, and later with Wolff & Zwicker of Portland, Ore., is now chief engineer of the Long-Arm System Co. of Cleveland. This company's system of operating bulkhead doors on shipboard from a central station was recently described and illustrated in the Review.

CONVENTION OF MARINE ENGINEERS

Washington, D. C., Jan. 31—The annual meeting of the National Marine Engineers' Beneficial Association, just adjourned, was one of the briefest ever held by the association. The business of the convention was devoted largely to constitutional and internal matters and little of general interest was transacted. Two of the days of the convention were spent in exchanging visits with the supervising inspectors of steamboats and with the delegates to the meeting of the American Association of Masters and Pilots of Steam Vessels. The wage schedule on the great lakes for marine engineers was given considerable attention but no conclusion was reached. The advisory board was empowered to take the subject up with the vessel owners. The next annual meeting will be in Cleveland in January, 1901.

The following delegates were in attendance at the meeting: George W. Towne, Samuel Moore and William Garrity, Buffalo; Evan I. Jenkins and Fred M. Harmon, Cleveland; Edward R. Blanchard, William Tindall and A. L. Jones, Detroit; George A. Grubb and M. Conley, Chicago; John H. Mittendorf, James H. Taylor and James Lee, Baltimore; William H. Fell, Milwaukee; Joseph Brooks, John W. Anderson and George Hoffman, Philadelphia; N. P. Slater, Bay City, Mich.; John W. Farrow, Pittsburg; William F. Yates, J. G. McG. Sterritt, P. J. McDermott, William J. Dubois, John J. Harrison, Frank McKee, Milton Fritts and L. J. Gratton, New York; Frank A. Jones, Thomas Malcolmson, San Francisco; Joseph Thomas, New Haven, Conn.; George A. Miller, Port Huron, Mich.; William R. Patterson, Manistee, Mich.; James H. Bishop, Duluth; John Henry, Sandusky, O.; Perry N. Knaggs, Muskegon, Mich.; George A. Nichols and Frank G. Wright, Boston; C. M. Sweeney, Pensacola, Fla.; Charles W. Robinson, Washington, D. C.; George N. Gibson and Dan H. Callahan.

The following officers were re-elected; George Uhler, national president; Frank A. Jones, national vice-president; George A. Grubb, national secretary; Edward R. Blanchard, national treasurer; James H. Taylor, Joseph Brooks and J. McG. Sterritt, members of advisory board.

The following preamble and resolution were presented and unanimously adopted:

Whereas, the interest of the whole country, the re-inforcement of our navy, the increased employment of our mechanics and marine engineers, and the training of men to man our ships would all be promoted by the restoration of our merchant marine to its former grand position on the seas of the world,

Therefore, be it resolved, by the National Marine Engineers' Beneficial Association, in convention assembled, that in our opinion it is the duty of congress at the earliest possible day to extend such aid by subsidy to American-built mail carriers and freighters as will enable them to successfully compete with the subsidized merchant ships of foreign countries in the carrying of our imports and exports; provided, that such ships shall be fully officered by citizens of the United States and in addition thereto at least 35 per cent of the balance of the crews shall be citizens of the United States.

This resolution is signed by Geo. Uhler, national president, and George A. Grubb, national secretary.

One of the Sound steamboat companies has ordered from the Sprague Electric Co. of New York, a Lundell generator to furnish 250 lights for one of its steamers.

The people know and appreciate a good thing when they see it. This is why the Nickel Plate road is so deservedly popular with the traveling public. A peerless trio of through express trains daily in each direction; uniformed colored porters in attendance on all day coaches; unexcelled dining car service. Rates lower than other lines. 7, Feb. 6.

LATEST REPORTS FROM THE SHIP YARDS.

Mr. Lewis Nixon, the energetic proprietor of the Crescent Ship Yard at Elizabethport, N. J., has begun arrangements for the enlargement of his plant, which has been in contemplation for some time past. He has within the past few days, purchased the property of the Connolly Iron Sponge & Governor Co., which adjoins his present yard, and has a frontage of 122 feet on Staten Island sound. The purchase includes a good wharf and the purchase price was $30,000. It is also reported that Mr. Nixon is negotiating for the purchase of the water front east of the Connolly property and which is now owned by Charles Meyer and the Staten Island Ferry Co. This deal, if consummated, will give the Nixon yard a water front of nearly 1,000 feet. There is also a report that the Samuel L. Moore Sons Crescent Iron Works may be amalgamated with or absorbed by the Nixon concern.

The Boston, Plymouth & Provincetown Steamboat Co., which was incorporated a few days since under the laws of Delaware with a capital of $250,000, will operate a line of steamers between Boston, Provincetown and Plymouth. Plans have been prepared for a steamer and bids are now being considered for its construction. The vessel, which will be named the Provincetown, will be 165 feet in length, 30 feet beam, 18 feet depth and 10 feet draught. She will be of the three-deck excursion kind and will have accommodations for 1,200 passengers and a large amount of freight. Triple expansion engines will drive a single propeller, and the four boilers will have a grate surface of 110 square feet. The contract calls for the completion of the vessel by the middle of June. The company will build or purchase a vessel of similar dimensions for the Plymouth route.

MEMBERS IN ATTENDANCE AT THE 1900 ANNUAL MEETING OF THE NATIONAL MARINE ENGINEERS' BENEFICIAL ASSOCIATION AT WASHINGTON.

Another ship building and repair plant is projected for the vicinity of New York city. The Morse Iron Works & Dry Dock Co. has been incorporated with a capital of $550,000, and Mr. E. P. Morse states that work will be commenced at once on the construction of a dry dock 800 feet long, extending from First avenue to the channel, along the water front at Bay Ridge. It will accommodate vessels of any size and will be ready next November. A two-story machine shop for repairs will extend along the side of the dock for a distance of 600 feet.

The new tug Richard Crocker, just completed by the Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, of Morris Heights, New York city, for the dock department of New York city, had a trial trip a few days since and developed a speed of 16 knots, which is remarkable for a vessel of her kind. The tug is of steel construction, deck house and all, and is 110 feet in length, and 26½ feet beam. Steam is supplied from a Seabury water tube boiler and the vessel is fitted with a full equipment of fire pumps.

A new steamer for which the framework was recently gotten out by Robert Palmer & Sons, Noank, Conn., is now building at the foot of Clinton street, Springfield, Mass. The work is being superintended by William Lathrope of Noank, William McAllister of Portland, Me., and E. P. Munger of Hartford, Conn. It is expected that the vessel will be ready for launching by the latter part of May.

A launching set for the near future is that of the tug Unity, building at the yard of Devine Burtis, Red Hook, South Brooklyn, N. Y., for the Union Towboat Co. The vessel, which is 90 feet in length, was originally contracted for by Bowring & Archibald of New York city, but was later transferred to the Union company.

T. S. Marvel & Co. of Newburgh, N. Y., are building a wooden steam lighter for Collyer Bros. of New York city. They have also on the stocks two steel tugs, building for the Cornell Steamboat Co. of Rondout, N. Y.

SHELLS AND PROJECTILES.

VARIETIES EMPLOYED IN MODERN WARFARE—MOST DEADLY WEAPONS THE WORLD HAS EVER SEEN—GREAT FORCE OF ARMOR-PIERCING PROJECTILES.

BY LAWRENCE IRWELL.

The war with Spain aroused general interest in fighting ships, and now the struggle in South Africa is prompting interest in shells and projectiles of all kinds—those used on shore as well as on ships. The idea of hurling explosives or fiery missiles into the ranks of an enemy is one of great antiquity. So far as reliable historic data exist, the first occasion of their use in actual warfare was about 325 B. C., when Alexander the Great, while attempting to extend his conquests to India, was opposed by arrows tipped with a fiery composition. No further progress in this direction, however, seems to have been made until the eighth century, when it is recorded that rockets containing a highly combustible mixture were often thrown in a burning condition amongst the enemy. Prescriptions for preparing such rockets are given by Marcus Graecus, who lived about the end of the eighth century, and whose manuscripts may still be seen in the French national library in Paris. It is also recorded that rockets of this description were used by the Saracens against the Crusaders, causing great discomfiture in the ranks of the latter. Such appliances as these, crude as they undoubtedly were, furnished the germ from which the modern projectile has evolved. To trace the development of such missiles up to the present day would be a task of considerable difficulty; it is only proposed here to give a brief account of the shells and projectiles at present used by the most highly civilized nations.

Four chief varieties are now employed in active warfare, each being constructed to attain a special object. They may be classified as follows: First, shrapnel, or man-killing shells; second, shells whose object is to destroy earthworks and fortifications; third, armor-piercing projectiles; fourth, star shells, used to provide light when a search-light is not available. It is proposed to give a description of each of these in the order named, and it may be well to state that each variety is made to a standard size, so that all may be fired at the discretion of the officer from the same gun.

The shrapnel, whose object is the destruction of human life, is one of the most deadly weapons of warfare the world has ever seen. It consists of a hollow cylinder of iron having an oval-pointed end separately attached, the pointed end securing a less resistance to flight and greater steadiness. Down the center of the shell is a small tube, open at the pointed end and communicating with a charge of powder at the base. The body of the cylinder is filled with bullets, numbering in some instances upwards of 300. When it is desired to fire the shrapnel, a time fuse is placed in the mouth of the inner tube immediately before loading. The time fuse consists of a conical piece of wood bored to a certain depth and filled with powder. A hole is bored from the exterior of the fuse to the contained charge of powder, through which the flash of the burning fuse may communicate with the powder at the base of the shell and cause it to explode. The actual firing of a shrapnel, therefore, consists of three distinct operations, namely, the ignition of the fuse, which is brought about by the burning of the cordite or powder in the gun at the moment of propulsion, the ignition of the charge at the base by the agency of the fuse, and finally, the explosion of this charge, which blows off the head of the shell and liberates the enclosed bullets, allowing them to scatter over an extremely large area. A shrapnel, in this manner, produces a result equal to 300 rifle bullets. A simple experiment may be made to illustrate the manner in which the "deadly hail" from a shrapnel is distributed. If a number of small stones be confined in a paper bag, the mouth of which is insecurely closed, and the bag be projected forward, mouth foremost, it will open during flight, and the contents will be observed to escape and scatter in various directions, much in the same manner as the jets of water from a watering can. The blowing out of the end of the shrapnel allows the contained shells to disperse in precisely the same manner that the opening of the paper bag during flight admits the escape of the stones.

It is obvious from the foregoing that the most advantageous place for the shell to burst would be at a short distance in front of the enemy, so as to obtain the maximum effect—a result which scientific gunnery has rendered possible at all distances within the range of the gun. By the use of the tables compiled by the late professor of mathematics at the English artillery college at Woolwich, the distance of any given projectile from the gun after the lapse of every fraction of a second can be accurately determined, and the results for each class of shell are recorded in the range-table possessed by every officer of a gun. All that is necessary, therefore, is to arrange to burst the shell at a given moment after firing, which can be done by adjusting the fuse so that the flash from it shall reach the bursting charge at the desired moment. As previously described, the fuse is bored immediately before loading, and the marks on the fuse indicate where it must be bored to flash at any required time. By these scientific processes, it is possible to obtain results of surprising accuracy, the error not exceeding a few feet in a range of several miles. It is this precision which makes the shrapnel shell such an extremely deadly missile.

When the object is to destroy fortifications or earthworks, a shell is used which contains a large charge of powder in the form of melinite or lyddite, which, unlike the shrapnel, has no bullets in the interior. Further, such shells are arranged so as to explode on striking, the fuse previously described being replaced by a percussion cap, which brings about the explosion of the charge when the shell strikes, in exactly the same manner as the firing of an ordinary rifle. In outward appearance this shell resembles the shrapnel, the pointed end being hollowed out for the reception of a screw plug resembling the cap, which, in turn, ignites the bursting charge, and the shell bursts into fragments with terrible violence. Such a shell in action is exactly equivalent to a charge of explosive placed in position for blasting purposes, and produces an equal effect. The fragments of the shell, in addition, often cause a great loss of life. In the naval engagements during the late war between China and Japan, cases occurred where a single shell of this type, striking some object on the deck of a battleship, not only wrought havoc among the appliances in the vicinity, but, by the fragments produced on its bursting, killed forty men. When it is realized that the largest shells contain nearly 200 pounds of explosive material, such terribly devastating results can be easily realized.

The armor-piercing projectile differs from the two former in containing no internal charge. It is practically solid, and has a cylindrical body and pointed end. The object of this shell is to pierce the steel armor of a vessel, and it must therefore be composed of an extremely hard and strong material to achieve this end. A special kind of steel is used in the manufacture of this kind of missile, which, although not sufficiently hard to develop brittleness, possesses sufficient toughness to resist crumpling on impact. The point is specially hardened, so as to render it capable of penetrating the best quality of armor plates. The destructive capacity of these projectiles is enormous, and the extent to which they will penetrate the hardest steel is truly surprising. A British artillery officer, Captain Orde Brown, has published a rule, based upon actual experiments, which states that "an armor-piercing projectile will penetrate a distance equal to its own diameter for every 1,000 feet of striking velocity." Thus a shot of this kind fired from a 10-inch gun, and striking at 2,000 feet per second, would penetrate 20 inches of steel; at 1,500 feet per second, 15 inches, and so on. The latter velocity would easily be obtained at close range, and in the event of the projectile striking truly, the thickest armor plate possessed by any warship afloat might be penetrated. The blow struck in this case would be equal to that produced by a weight of 750 tons falling a distance of 10 feet. Recent improvements in hardening the surface of armor plates, however, have greatly diminished the efficacy of armor-piercing projectiles, and it is probable that with newly-manufactured plates the actual penetration would not be more than one-half of that given in Captain Brown's rule.

The fourth class of shells—star shells—do not partake of the destructive character of those previously described. Their object is merely to furnish a light by means of which the movements of the enemy may be clearly discerned on a dark night, and surprises thus avoided. In their mode of action, they resemble a shrapnel, and are arranged so as to burst in midair by the agency of a fuse and bursting charge. They contain a special composition, consisting of barium nitrate, chlorate of potash and powdered magnesium, which is inflamed by the bursting charge and produces an intensely brilliant light. (A similar composition is employed for flashlight photography). By means of these shells a very large tract of country may be illuminated, and in this way any attempts at night attacks may be discovered. Star shells of this kind have been employed in India, and have been found most useful.

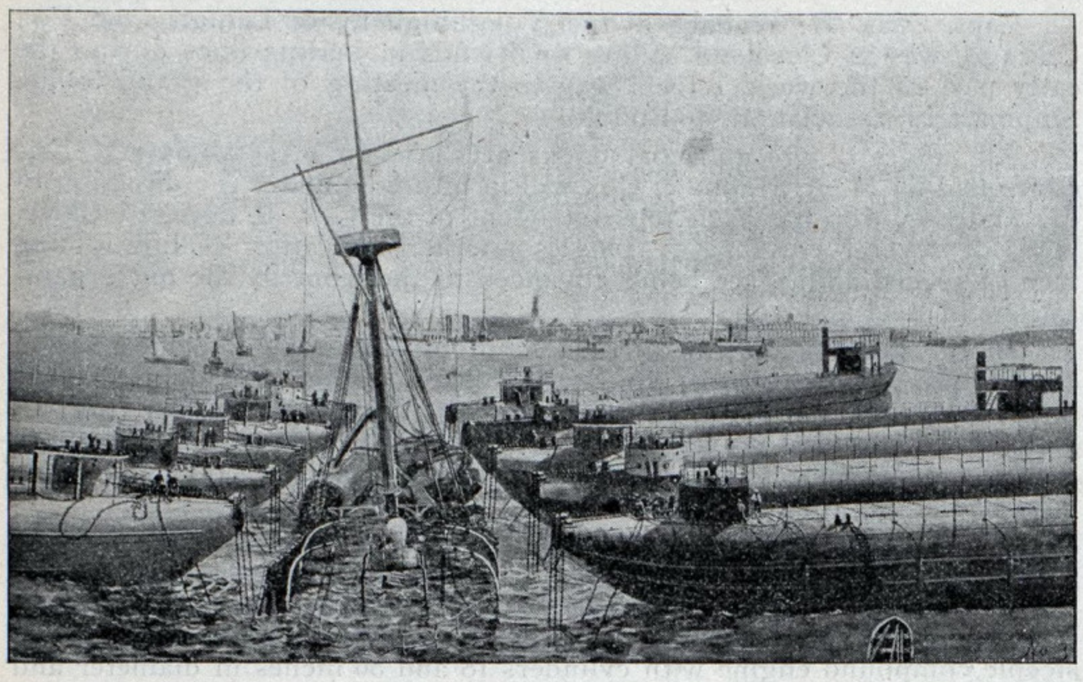
With such missiles as the foregoing, it is evident that warfare at the present day has far greater capabilities for destruction than at any previous period of the world's history. When we realize that any of these projectiles may be hurled enormous distances with great accuracy, we may well stand aghast at the possibilities of a great war.

SUEZ CANAL THIRTY YEARS OLD.

"The Suez canal undertaking can now look back upon thirty completed working years, that waterway having been opened for traffic with much ceremony by Ismael Pasha, the then Khedive, in the month of November, 1869," says the Liverpool Journal of Commerce. "The compatriots of Ferdinand de Lesseps, the engineer of the scheme, have not been unmindful of his memory, and a colossal statue of the great canal-maker was in November last erected on the western shore of Port Said. and now stands in full view of every vessel passing in either direction. The opposition which Lesseps' plans met with in England, and the weak and lukewarm support he received from the French government, not to mention the suspicion and distrust shown by the Sublime Porte, were enough to deter a less strong-minded man than Lesseps from the task, but Lesseps remained true to his ideal, with the result that we have seen Lord Palmerston's misgivings as to the effect of the cutting of the canal upon British interests and the integrity of Turkey all proved to be baseless, and we now find ourselves the largest shareholder in the enterprise as well as its best customer. But the political difficulties were not the only obstacles in the way of connecting the Mediterranean with the Red sea. There were physical difficulties also. Long before Lesseps' time scientific men declared that there was a great difference in the sea levels of the Mediterranean and the Red sea, and M. Lepere, an engineer sent to Egypt by Napoleon I to study the question, reported that the difference between the levels was so great as to render the making of a canal impossible. Forty years later, however, a series of experiments established the fact that the water level at Suez and Port Said was the same, and that it was quite feasible to cut a waterway between those two places without the necessity of making locks. Another difficulty (real to a certain extent, this one) was the risk of silting up by the sand and mud washed down into the sea by the Nile and invariably carried in an easterly direction by the tide, but this has been overcome by energetic dredging. It was further predicted that collisions would be constantly occurring, but this is very far from being the case. On the whole, it must be said that the managers of the canal have been quite equal to their task. Since the year 1876, when Great Britain purchased a number of shares in the company from the Khedive (then in financial difficulties) for the sum of £4,000,000 sterling (now worth about £26,500,000), giving to Great Britain, as it did, a weighty influence in the management, many improvements have been carried out. The sidings, where the largest vessels can pass each other, have been increased by nine, and not only that, but the width has been so much increased throughout the whole length of the fairway that vessels for the most part can pass each other without bringing up in the sidings, so that cases where waiting is a necessity are the exception. Whereas, at the beginning, the passage through the canal generally took forty-eight hours, since the introduction of the electric light this has been reduced to seventeen hours, and is now never more than twenty-four hours. There is one thing, however, which will probably have to be attended to in the near future, and that is the adequate deepening of the canal bed. The tonnage of steamers has increased so much of recent years that fully-laden vessels often draw as much as 27 or even 30 feet of water, and it is possible that the necessity will soon be made manifest for providing a safe and unhindered passage through the canal for ships of this draught."

WHALEBACKS TO RAISE THE MAINE.

One of the illustrations presented herewith shows a plan suggested to the government some time ago by Capt. Alex McDougall of Duluth, inventor of the whaleback type of vessel, for raising the sunken battleship Maine. The second picture is that of one of the whaleback steamers of 3,000 tons capacity having her stern raised by one of her consorts of about the same size. This second picture represents an actual occurrence, as the whaleback steamer Bartlett, with 125 tons of fuel in her bunkers, was raised in this way by one of her consorts at South Chicago. The picture will also aid in illustrating the scheme proposed for raising the Maine, as it serves to show what can be done with the whalebacks, on account of their peculiar construction and light draught, some of the tow barges drawing only 3½ feet without cargo, and the 3,000-ton steamers only 10



feet aft with nothing in the extreme bow, so that their mean draught would be but about 5 feet. But it is understood, of course, that these vessels have very large water ballast capacity, to be used when required, and that they are loaded down to full 18 feet in carrying ore, although they are themselves of only 22 feet depth in some cases. The manner in which a tow barge is made to lift the stern of a steamer, as shown in the second illustration, is as follows: The forward compartment of the consort or tow barge is filled with water, and chains fastened to the stern of the steamer are hove taut with windlass. Then the water is pumped to after compartments of the consort, resulting in a leverage being secured the full length of the vessel (300 feet), so that 400 tons is thus raised on a draught of 7½ feet.

It was to this principle that Capt. McDougall directed the attention of the navy department when he proposed that whalebacks be used to raise the Maine. It was his idea to send to Havana by way of the St.

Lawrence after the season was at an end a fleet of ten or more of the vessels in service on the great lakes. On arrival at the scene of the wreck, divers with electric drills would make holes in the bilges or sides of the Maine, say four in each place and about 5 inches apart. Into these holes a steel casting, shaped like a hand with the fingers open and bent, would be placed. In the palm of this steel hand there would be a large hole to engage the shackle of chain attachments that would be made on both sides of the wreck to the bows of as many whalebacks as would be required to make the lift. Only a short lift would be made with each effort, but it was Capt. McDougall's idea that the wreck could in this way be gradually worked into very shallow water.

Secretary Francis T. Bowles has just sent out the 1900 edition of that very useful little handbook the manual of the Society of Naval Architects and Marine Engineers. In addition to the full list of members of all classes—and the list has been considerably lengthened—with their addresses, the volume contains the constitution and by-laws and considerable other data. Information which will be especially appreciated by every member is the complete index of all the papers read at the different annual meetings of the organization, together with a notation as to the volume of the transactions in which they may be found.

A newspaper dispatch from Vancouver, B. C., states that a representative of the Vanderbilts has been in that city for some time past and has acquired for a New York syndicate two miles of water front and other property which will entail an aggregate outlay of nearly $2,000,000. About 1,000 acres is embraced in the purchase. It is proposed to erect a system of docks along the entire front of the property, and indeed almost all the available water front in the vicinity of the city suitable for the use of deep water shipping has been included in the transfer.

COMMERCIAL SUPREMACY.

NEW YORK STATE DEMANDS IT AND WILL VERY PROBABLY CARRY OUT THE SIXTY MILLION DOLLAR CANAL ENLARGEMENT SCHEME RECOMMENDED BY GOVERNOR ROOSEVELT.

Buffalo, Jan. 31.—It is gratifying to the friends of the Erie canal to find that an active campaign is to be opened soon in advocacy of the plan of the governor's committee, which asks for the expenditure of $62,000,000. So far there does not appear to be any objection to the plan beyond that which would have been the case with any plan. Some are afraid of the placing of so much money in the hands of state officials to spend, and they use the wasting of a part of the $9,000,000 appropriation as an argument. Others want to air their superior wisdom and can do it in no other way but in trying to show that something better might have been proposed. This latter class is not dangerous and will fall into line in good time, and it is not believed that the other class is numerous enough to be dangerous.

There will be a meeting on 'Change, probably some day this week, to listen to a paper on the subject by Major Symons, the government engineer located here, who will explain the situation fully, giving reasons for this or that conclusion reached by the committee. The paper is prepared primarily to be read before the students at Cornell University, but it being of so much importance to Buffalo it will also be given here. Major Symons was the engineer member of the committee and is fully prepared to justify all figures advocated by the plan and all departures made by it.

There has been some disposition on the part of certain writers on the subject to make unfavorable comment on the report, as compared with the report of the New York commerce commission, which was sent to the legislature the same day by Gov. Roosevelt. It is found that the latter body, which dates back to Gov. Black's administration, has advocated canal improvement as heartily as the Roosevelt committee has done, but only $15,000,000 is asked for by it. This difference may be explained in two ways, which are not at all contradictory. The older body was not prepared to fortify itself in any advocacy of extraordinary outlays for the work. I am informed, by the way, that the members would be glad to see a barge canal built, just as it is proposed by the Roosevelt committee, but it had not the courage of its convictions and therefore left the more radical proposition to the other commission. That there are any cross purposes between the two bodies must not be supposed for a moment. It is emphatically stated that there is entire harmony.

It is gratifying to find that capitalists with anything like large stakes in the general business of the country do not for a moment hesitate over the cost. "Will it do what it is expected to when the outlay is made?" That is the question with them. This question, made as it is with every expectation of an affirmatory answer, in a way revives the fact that the $9,000,000 failed to do what was promised, yet that plan should now be recalled for exactly what it was worth and when it is there will be small argument in it against the present plan. In the first place the amount asked then was not made in the best of faith. This is seen from the fact that little or no provision was made for anything but the enlargement work. The cost of setting everything to rights and paying claimants along the line for loss incurred by the work was left to take care of itself. So it was found almost at the outset of the work that much of the funds must be diverted into auxiliary outlay, and soon the contracts themselves had to be stopped for want of money. At the outset the contractors themselves took the wink that may have been "tipped" wholly without intention by the state authorities. Reports from them before a stroke of the work was done were to the effect that they would get $20,000,000 out of the thing before they were done with it. Whether they did some figuring on their own account or merely reckoned from precedent need not be asked now. It remains a fact that they were pretty nearly right in their cue. They failed only because the work was stopped half done.

It is now a different matter. Estimates of cost are made on a basis of high prices. They are the result of the most careful study on the spot and with the expectation that nothing will be accepted whole cloth, as the former estimates were. On the whole the plan is as likely to be accepted as the other was. The committee has found it to be the only thing to do. It has shown what it will do and New York would spend much more than that amount rather than to lose commercial supremacy.

To show that the committee has satisfied itself that it has estimated the cost in outside figures, I may note that one of the members said to me this week that he would like to be one of a syndicate to do the work for the amount estimated. He added that the governor could name a commission that would build the new canal, for such it will be in reality if rebuilt on these lines, for less than $60,000,000. There seems to be no expectation that this method will be chosen, though there could be no harm in so doing.

JOHN CHAMBERLIN.

SHIP BUILDING OUTLOOK ON THE CLYDE.

The outlook for ship building in 1900 on the Clyde is pronounced very flattering. The tonnage uncompleted aggregates 450,000 tons, and while this is fully 75,000 tons short of the aggregate at the opening of last year, it compares most favorably with the vessels on hand at the corresponding time in 1896 or 1897. It is interesting to note that whereas a year ago there was not a single sailing vessel under construction, work is now in progress on ten. The outlook among ship builders on the Wear is only slightly less favorable than on the Clyde, builders having on hand sufficient commissions to keep them busy for upwards of a year. The enlargement of several of the yards is in contemplation.

Secretary Root of the war department has transmitted to congress a plan for improving the Southwest Pass, Mississippi river, for the purpose of permitting the passage of ocean steamers to New Orleans. The scheme was drawn by Col. Roberts and Major Derby of the army engineers, and Robert Moore and William Sterling, civil engineers. It contemplates a channel 1,000 feet wide and 35 feet deep at mean low water throughout the Southwest Pass. The whole cost is estimated at $6,000,000.

FULL 18¼ MILLION TONS OF ORE.

Reports of both lake and rail shipments of iron ore from all producing mines in the Lake Superior region for 1899 show a total output of 18,251,804 gross tons, against 14,024,673 tons in 1898 and 12,469,638 tons in 1897. The total output of this mining country since the first property on the Marquette range was opened forty-four years ago, is 152,359,591 tons, more than one-third of which has been produced in the past four years.

SHIPMENTS BY PORTS AND ALL-RAIL.

	1897 Gross Tons.	1898 Gross Tons.	1899 Gross Tons.
Escanaba	2,302,121	2,803,513	3,720,218
Marquette	1,945,519	2,245,965	2,733,596
Ashland	2,067,637	2,391,088	2,703,447
Two Harbors	2,651,465	2,693,245	3,973,733
Gladstone	341,014	335,956	381,457
Superior	531,825	550,403	878,942
Duluth	2,376,064	2,635,262	3,509,965
All-Rail	253,993	369,241	350,446
Total	12,469,638	14,024,673	18,251,804

SHIPMENTS BY RANGES.

	1897 Gross Tons.	1898 Gross Tons.	1899 Gross Tons.
Marquette Range	2,715,035	3,125,039	3,757,010
Menominee Range	1,937,013	2,522,265	3,301,052
Gogebic Range	2,258,236	2,498,461	2,795,856
Vermillion Range	1,278,481	1,265,142	1,771,502
Mesabi Range	4,280,873	4,613,766	6,626,384
Total	12,469,638	14,024,673	18,251,804

MARQUETTE RANGE.

Mine.	Gross Tons.	Mine.	Gross Tons.
Cambria	124,930	New York	6,642
Champion	215,074	Princeton	55,802
Cleveland-Cliffs	1,011,048	Queen	342,978
Imperial	23,235	Republic	137,085
Jackson	88,230	Richmond	4,613
Lake Angeline	464,988	Starwest	6,716
Lake Superior	682,595	Volunteer	29,983
Lillie	196,200	Winthrop	171,318
Negaunee	195,573		
Total			3,757,010

MENOMINEE RANGE.

Antoine	93,025	Hemlock	110,269
Aragon	337,807	Hilltop	3,496
Bristol	80,915	Keel Ridge	4,900
Chapin	940,513	Lamont	67,652
Commonwealth	117,295	Lincoln	43,622
Columbia	126,290	Loretto	64,824
Crystal Falls	147,346	Mansfield	86,607
Cuff	20,210	Millie	15,194
Cundy	100,902	Penn Iron Mg Co.	229,651
Dober	10,980	Pewabic	530,129
Dunn	7,458	Quinnesec	11,050
Florence	74,235	Riverton	2,262
Great Western	43,316	Sheridan	31,104
Total			3,301,052

GOGEBIC RANGE.

Ada	7,977	Minnewawa	1,255
Ashland	154,615	Montreal	153,307
Atlantic	19,964	New Davis	5,029
Aurora	170,369	Newport	263,711
Brotherton	78,858	Norrie	714,669
Cary	62,524	Pabst	263,869
Colby	103,239	Palms	154,705
Comet	332	Shores	11,819
Iron Belt	105,934	Sunday Lake	12,526
Mikado	10,324	Tilden	500,830
Total			2,795,856

VERMILLION RANGE.

Chandler	808,359	Savoy	86,191
Minnesota	457,732	Zenith	79,323
Pioneer	339,897		
Total			1,771,502

MESABI RANGE.

Adams	720,474	Kanawha	14,963
Auburn	385,992	Lake Superior	154,326
Biwabik	553,836	Mahoning	750,341
Canton	99,498	Malta	28,615
Cincinnati	246	Mountain Iron	1,137,970
Cloquet	1,621	Ohio	293,651
Commodore	152,947	Penobscot	85,619
Day	1,975	Pillsbury	106,487
Duluth	165,435	Roberts	57,847
Elba	9,547	Sellers	174,867
Fayal	1,072,257	Sauntry	53,004
Franklin	60,000	Sparta	237,143
Genoa	276,559	Williams	12,357
Hale	18,807		
Total			6,626,384
Total all ranges			18,251,804

The fourteenth annual meeting of the Canadian Society of Civil Engineers was held at Montreal yesterday (Wednesday) and the members of the society are now enjoying a three days' visit to Boston for the purpose of making an inspection of the works of engineering interest in Boston and vicinity.

AROUND THE GREAT LAKES.

It is said that the steamer James Fiske, Jr., of the Union Transit Co.'s fleet is for sale, but not at a great bargain, and in fact probably not at a price that will attract buyers, as her owners are not specially anxious to sell.

The steamer Mary is being rebuilt by the Graham & Morton Transportation Co. of Chicago. After the fire on this vessel the hull was raised and she was torn down to light water mark. She will come out practically a new steamer.

Capt. James Leisk of Milwaukee, who has been in command of the steamer Helena since she came out in 1888, will next season be in charge of one of the 500-foot steel steamers building for American Steel & Wire interests.

Capt. Chas. H. Wallace of the Youghiogheny & Lehigh Coal Co., Chicago, was in Cleveland calling on friends in marine lines during the early part of the week, on his way to the meeting of the grand lodge, Shipmasters' association, at Buffalo.

All affairs of ore and coal docks at Cleveland, Ashtabula and Erie controlled by M. A. Hanna & Co., will in future be under the direction of M. Andrews, who has been superintendent of the C. & P. docks at Cleveland for several years past. This is another indication of how young men of special ability are being advanced to the front by the big organizations in steel and iron.

In the general shifting of offices among the ore companies, vessel owners and vessel agents of the Perry-Payne building, Cleveland, Hutchinson & Co. have secured enlarged quarters on the third floor. W. C. Richardson is settled in elegant offices on the fourth floor, and Hawgood & Moore have gone to the second, where they get more room than they have had at any time in the past.

The steamer Fayette has been sold to a company of which Capt. James Sanford of Muskegon, Mich., is manager. The vessel is now at Muskegon being rebuilt and will be fitted with new keelsons, 3,000 feet of new deck, new boiler house and cabins, six new deck beams, a new steeple compound engine with cylinders 18 and 36 inches in diameter and 28 inches stroke, and a new water bottom. The vessel will probably be renamed the Mathew Wilson.

Vessel men are all hoping that Postmaster Dickerson of Detroit will succeed in securing the increase in salary that is asked for the men connected with the Detroit river marine postal service. The value of this service is not confined to the vessel owners and shippers. It extends to all the men employed on the vessels, and this is the one great feature in its favor, as these men could not afford to pay for a special service of this kind through agencies.

Thirty graduates of the Chicago Nautical School gathered at the Sherman House in Chicago a few evenings since and held the first annual reception and banquet of the alumni association. Lieut. G. E. Gelm, U. S. N., of the Chicago branch hydrographic office was the guest of honor, and responded to the toast "Our Navy." Other toasts were "The Chicago Nautical School," responded to by Lieut. W. J. Wilson, principal of the school; "The Yachtsman," by C. B. Darling; and "The Lake Marine," by Capt. Edward Kohnert and Capt. Walter Hamilton. During the evening the Chicago Nautical School Alumni Association was organized.

In addition to the steamers Arthur and George Orr, purchased last fall, the Canada-Atlantic Transportation Co. secured, several weeks ago, the canal-size steel steamer building at the Bertram Engine Works, Toronto, and now it is announced that they have chartered the steamer Kearsarge from Pickands, Mather & Co. of Cleveland, and the steamer Gratwick (steel) from Drake & Maytham of Buffalo. This gives the Canadian company quite a large fleet to replace the Menominee line steamers of Cleveland on which charters expired with the close of last season.

It is announced from the office of the Great Lakes Register, Cleveland, Capt. F. D. Herriman chief surveyor, that the second edition of the register, now in the hands of the printer, will be ready for distribution March 1. It will contain the names and data of construction, both of hull and machinery, of some 4,500 vessels navigating the great lakes, of which some 500 have applied for and have received class in the register during the season of 1899. This register also contains up-to-date rules and tables for the construction of steel, iron and wooden vessels, with illustrations and technical drawings of the principal parts of modern lake-built steel freighters.

TO LIGHT ALASKAN COAST.

Washington, D. C., Jan. 31—The senate committee on commerce has reported favorably a bill for the establishment of joint light-houses and pay signal stations on the coast of Alaska. Ever since the gold discoveries in Alaska began to draw navigation into those waters, the light-house board and the coast survey have seen the need of an extensive system of aids to navigation in the narrow passes and amid the swift currents of that fog enveloped region. Recently the light-house board has made preliminary surveys and has fixed locations for twelve lights that are imperatively needed.

The exact expense of constructing these lights cannot be given with accuracy, the amount in each instance depending on the availability of timber and the distance to which other materials must be transported. The light-house board has asked for $500,000 for this work, but the committee is of the opinion that the original sum of $300,000, recommended by the board in its report for the fiscal year, is sufficient.

The prime factor of the success of any railroad consists simply in catering fully and generously to the public demands. This is what has brought the Nickel Plate road to the front in railway matters, despite formidable competition. As a through road between the west and east it is the favorite with the traveling public. Fine trains, unexcelled service and low rates; a peerless trio of advantages. 6, Feb. 6.

COMMERCIAL RACE OF NATIONS.

ANOTHER INTERESTING LETTER IN THE SERIES ON AMERICAN COMPETITION THAT IS BEING PRINTED BY ENGINEERING OF LONDON—ORTHODOXY IN MATTERS COMMERCIAL NOT HELPFUL TO ENGLAND.

BY H. F. J. PORTER OF BETHLEHEM STEEL CO.*

I am given to understand that there is a well defined feeling abroad that American competition has become a menace to England's manufacturing interests, and I am asked my opinion as to the causes which have brought about this condition of affairs, and what remedy, if any, can be applied. If the situation is as stated, if England is just opening her eyes to the seriousness of her position, and is only now beginning to take steps to relieve it, perhaps we may see in these facts a racial deficiency in perspicacity which, if it exists, would in itself be crucial. Human nature may be the same the world over, but certain characteristics are more pronounced in some people than in others, and these differences make for, or check progress. For instance, our perception is generally dull to the effect of the gradual changes that are taking place about us, and our ability to formulate our thoughts into language, acts more slowly than our senses, so that when we see and feel these changes, considerable time elapses before we become sufficiently impressed by them to state our ideas and give logical reasons for their existence. Then again, when the reality begins to assert itself, there is often a tendency to adopt a ready-made phrase to express our sentiments, due possibly to a mistaken idea that it does not fall within our province to give the matter careful investigation. Even when the situation becomes clearly defined and our duty is apparent, we are prone to postpone individual action, fearing its futility. United action requires leadership of a type not always available, so that until the situation becomes so unbearable as to affect us personally we make no move. If my understanding of the situation is correct, these characteristics must be unusually pronounced in the English people.

Such a change in commercial conditions as that under consideration is slow in maturing. There are in general too many contending interests to allow of rapid alteration of methods. When, therefore, we hear that a new condition of things is assuming form, if it is sufficiently obvious to be recognized at all, we can depend upon it that it has actually existed for a considerable length of time. In point of fact, statistics have long shown the ebb and flow of the tide of trade so plainly, that Englishmen, had their business acumen been acute, would not have waited for the recent succession of losses of large contracts to awaken to the situation. But Englishmen, it must be acknowledged, know how to accept temporary defeat and profit by experience. As in war, so in commercial rivalry, nothing is accomplished by despising an adversary. The only way to overcome him is to study his methods, in order to profit by the knowledge gained.

The editors of Engineering have gone about attaining this end, and obtaining an analysis of the situation very much as did the minister who found his congregation dwindling away. He sent out a circular letter to the people of his parish asking them why they no longer came to his church, or why they went to another. He soon obtained the reasons he was seeking for, but he also found that if he wished to meet the requirements given as necessary for the return of his people, he would have to reconstruct himself on entirely new lines, and being no longer a young man, and therefore set in his ways, it would be difficult and perhaps impossible to regain his former popularity. There were two alternatives open to him to select from, before closing up his empty church. Should he on the one hand try to adopt the methods adopted by his more successful brother, to whom his congregation had flocked; or on the other, was not the situation after all a temporary or traditional one in which, guided by his own matured advice, based on broad views gained by long experience, a young and resourceful assistant could meet the present crisis? It did not require long reflection to convince himself that imitation could never equal the original, and the second alternative was finally considered food for reflection. In the present issue it is likewise presented as offering a possible solution of the problem.

The factors entering into the causes of change in industrial conditions are many and varied, and scientific reasoning regarding them may be true or false with equal probabilities. It must fall back finally upon trial, and success or failure in the future to prove its case. But whatever the inference, there is no escaping the fact that such changes take place along lines of least resistance When, therefore, an effort is to be made to counteract a move in the process of development, these lines must be strengthened beyond the ability of the attacking force to penetrate them. The chief reasons why the older nations fall by the way is that the thickness of the warp and woof of the mantle of customs and laws that was woven to protect them, prevents their adapting themselves rapidly to the changing conditions of their environment. Such changes, if permanent, are steps in the march of progress, which are directed by unyielding laws working with extreme severity towards the consummation of an inscrutable plan.

England's manufacturing industries, old as the nation itself, weighted down by traditions which have incrusted them, rumble along the highway of trade in ruts so deep that they can with difficulty be extricated. There seems to be an orthodoxy in matters commercial which has been adhered to with a faith stubborn to conviction. Whatever may be the reason, it seems to be true that the Englishman adheres to his ideals longer than his American cousin, and when finally he awakens to the fact that they are destroyed, he receives a shock which apparently bewilders him. Americans have had no standards. Their knowledge in general has been derived from precedents, and a proper selection of the good from the bad experience of the past. They have adopted the best devised methods of reducing cost, and raising quality of product, regardless of the expense attending such a policy, trusting to their soundness to bring about satisfactory results. It is still a question in the mind of sociologists whether the methods adopted to turn out work quickly and cheaply is not developing a country of specialists who have not the deeper knowledge of affairs which eventually determines the greatness and soundness of a nation. Americans, however, possess a self-confidence in their resourcefulness in cases of emergency which has stood by them in the past, and will in all probability not fail when the next necessity for it arises. But even if Englishmen may satisfy themselves by the most logical reasoning that the methods of American competition will eventually react upon their body politic, the fact still remains for England to consider now that when her trade is gone, it is gone, and it does not require demonstration to prove that it is easier to hold possession than to get it back after it has been taken away. Improvement comes from sad experience, and as in civilized society, self-protection demands laws leading to the betterment of conditions, so also the protection of commercial interests leads to the establishment of regulations, which make for improvements affecting mutual welfare. Thus it would seem that the situation in England demands that some existing laws be modified, and that others be enacted to meet the impending situation. There must be no compromise with expediency. Politics must not enter into the question. Such laws must be enacted at the behest of the united manufacturing interests of the country, which must come together for deliberation and determination.

The man who has sense enough to know that the fabric of customs and laws which has taken a thousand years to weave, cannot be disrupted in as many days, will find himself a long way on the road in the right direction towards advocating effective legislation. It is to be borne in mind in considering a commercial race between two nations, that there is no limit to progress, and that there is plenty of time. That nation which promulgates and adheres to the best methods will reach the goal first and hold it. That ever present problem, the so-called "labor question," must be met in England as in America, through a more thorough understanding by employer and employes, and of what those two classes owe to each other. Such an understanding can come about only through education in social science in the public school, the university and by the press. It would pay the labor unions well if they would employ the ablest political and social economists of the nation as their leaders, and to represent their interests at the councils of the manufacturers. The situation must be studied by specialists in organization and management. Provision must be made in the technical schools for courses in manufacturing engineering, where specialists of this type can be turned out. New shops should be organized under their direction; old ones gradually regenerated by their suggestions. Thus the most practical and scientific methods would be adopted which, with an individuality adapted to each case, would lead to rapid progress in eliminating error. Conflicts will arise between theorists and practical men, but success will attend those who with tact have the courage to adopt a broad policy of management. The question would soon be, not whether a manufacturer can afford to adopt such a policy, but whether he can afford not to adopt it.

It is an ever true maxim in life, and one especially applicable to the present instance, that the only successful method is one which will produce the best results with the least expenditure of time and money. Once such a method has been adopted, and the opposition it creates has been crushed or worn out, it is surprising how it will persist. It is like a tender but prolific herb implanted among other vegetation which may be hardier than it is. Give it every opportunity to start, with soil, moisture, sun and air favoring, and it will overrun its neighbors to their extinction. All about is the great mind of the universe ready for absorption. I take it for granted that England's commercial interests will move to assume a more favorable attitude towards it. Undoubtedly blunders will be made in the process, but it is only by doing something and correcting mistakes as we make them, that progress is made. The man who does nothing fearing that he will err, gets nowhere and is left behind. So if in the future, English enterprise fails to develop along modern lines, it will be because negative influences overpower those that make for progress, and hold it down to where it is and has been. In situations as complex as this the most astute reasoner has no precedent on which to base his arguments. He may perhaps have temerity enough to point out the way, but it is doubtful whether those to whom he may address himself, would or could accept his suggestions. No two men would agree with him.

"We see by the light of thousands of years,
And the knowledge of millions of men,
The lessons they learned through blood and in tears,
Are ours for the reading, and then
We sneer at their errors, and follies, and dreams,
Frail idols of mind and of stone,
And call ourselves wiser, forgetting it seems,
That the future may laugh at our own."

* One of a series of letters from Americans on "American Competition," which are being printed in Engineering of London.

LARGE SHIPS FOR THE PACIFIC.

Mr. J. J. Hill, president of the Great Northern Railway, and well known as one of the leading spirits in transportation affairs of this country, has plans under way for a most extensive development of the commerce of the Pacific, although he states in a letter to the Review that he is not yet ready to furnish any particulars regarding the vessels which he is building or which are to be built for this service. It is known, however, that of a fleet of twenty-five new vessels which Mr. Hill hopes to see in service ere long on the Pacific, some are already building or under contract. Most of the vessels will have a speed of 12 to 14 knots. Referring a few days ago to his plans on this score Mr. Hill said:

"I propose to build as many vessels as the trade with the Orient will justify, and that will be a great many. The natural market for the Pacific coast is China, Japan and the Philippines. The docks at Seattle are large enough to accommodate all of the shipping for some time, but eventually the conditions will warrant more extensive harbor accommodations. It is too far from the Pacific coast to the eastern states to ship many of the northwestern products to the east. A market for grain in the Orient will give the farmers a price higher than they can get in the east. The products of the iron and coal mines and lumber regions in the northwest can be sold to better advantage in the markets of the Orient than they can bring in the east. It is not like forcing something upon the market that people don't want. They want everything we can take to them, and we want their products. We shall have twenty-five steamships in this service within the next five years. The vessels will be of the largest size, with enormous carrying capacity and comparatively slow speed. Speed is not so much of an object as to be able to lay the goods on the other side of the Pacific so that they may compete with native products."

THE OCEAN DEPTHS.

A considerable amount of positive information concerning oceanography and its allied sciences is expected shortly from Germany. About two years ago, at a meeting of German naturalists in Leipsic, Germany, Professor Chun, of the Leipsic University, proposed that a deep-sea expedition be sent out for oceanographical, chemical, physical, and zoological investigations. The German government gave $75,000 toward the expenses, and promised additional funds to cover final cost and publication of results. The Hamburg-American Steamship Co. contributed the steamer Valdivia, of 2,600 tons burden, with crew and equipments, including a deck house for microscopic work, laboratories, and apparatus. The scientific staff is composed of eight specialists of reputation in oceanography, botany, zoology, chemistry, and bacteriology. The Valdivia sailed from Hamburg on August 1, 1898, and although the investigations have not yet been finished, and only preliminary reports have been furnished so far, the expectant public will certainly not be disappointed in the final results and achievements. Knowledge of the great depths of the ocean is only obtained with considerable difficulty. Deep-sea soundings are, above all other operations, liable to error, because of the prevalence of submarine currents of great force moving in various directions. These naturally interfere with the vertical descent of the sounding weight, and cause miscalculations as to the depth obtained. This probably accounts for some of the stories given in older nautical works, where depths of eleven, twelve, and even sixteen miles, are solemnly averred to have been sounded. In later days, however, great depths have unquestionably been properly ascertained by means of special instruments in the hands of competent and careful navigators and scientists. The instrument that is now usually used for the purpose of deep-sea soundings, and which has given general satisfaction as to accuracy, is known as Brook's line. It consists of a long iron rod, with a cup-like hollow at one end. The rod, when ready for use, is passed through a hole in a heavy iron ball, varying in weight from 70 to 170 pounds. This ball is fastened to a hinged fork at the top of the rod by means of a line passing around it, the ends of the line being drawn over two points of the hinged fork. The uppermost points of the fork carry the lowering line. While the weight of the apparatus is borne by the lowering line in passing through the water, the hinged fork is kept upright, and the ball is fast. As soon as the cup of the rod strikes the bottom, the hinges fall, and the ball slides off, leaving the rod to be pulled up with whatever may be in the cup in the shape of sand, shells, or other similar substances. The lowering line carries a number of knots at regular intervals, and from the increased or decreased rapidity with which these knots slide over the ship's rail, the striking of the point of the rod can be estimated with fair accuracy.

It was this instrument that gave the first proof that organism existed at great depths. From the plateau of the Atlantic ocean it brought numerous perfect but very small shells; from the Indian ocean, at a depth of about 3,500 yards, spicules of sponge. This was considered sufficient evidence that certain low forms of life can exist under immense pressure, in entire darkness and intense cold. That the pressure is indeed enormous can be readily conceived when it is remembered that a cubic foot of water weighs 62.5 pounds. Some of the earlier forms of measuring instruments were drawn back to the surface broken and rendered useless by the pressure to which they had been subjected. This is not to be marveled at, since the pressure is 14.7 pounds per square inch at the surface; at a depth of 30 feet, the pressure is doubled; at 60 feet, it is trebled; and so on in increasing ratio, until at a mile depth the pressure is about 3,000 pounds to the square inch. This means that a soft body, such as that of a man, for instance, should it reach such a depth, would be reduced to a shapeless pulp.

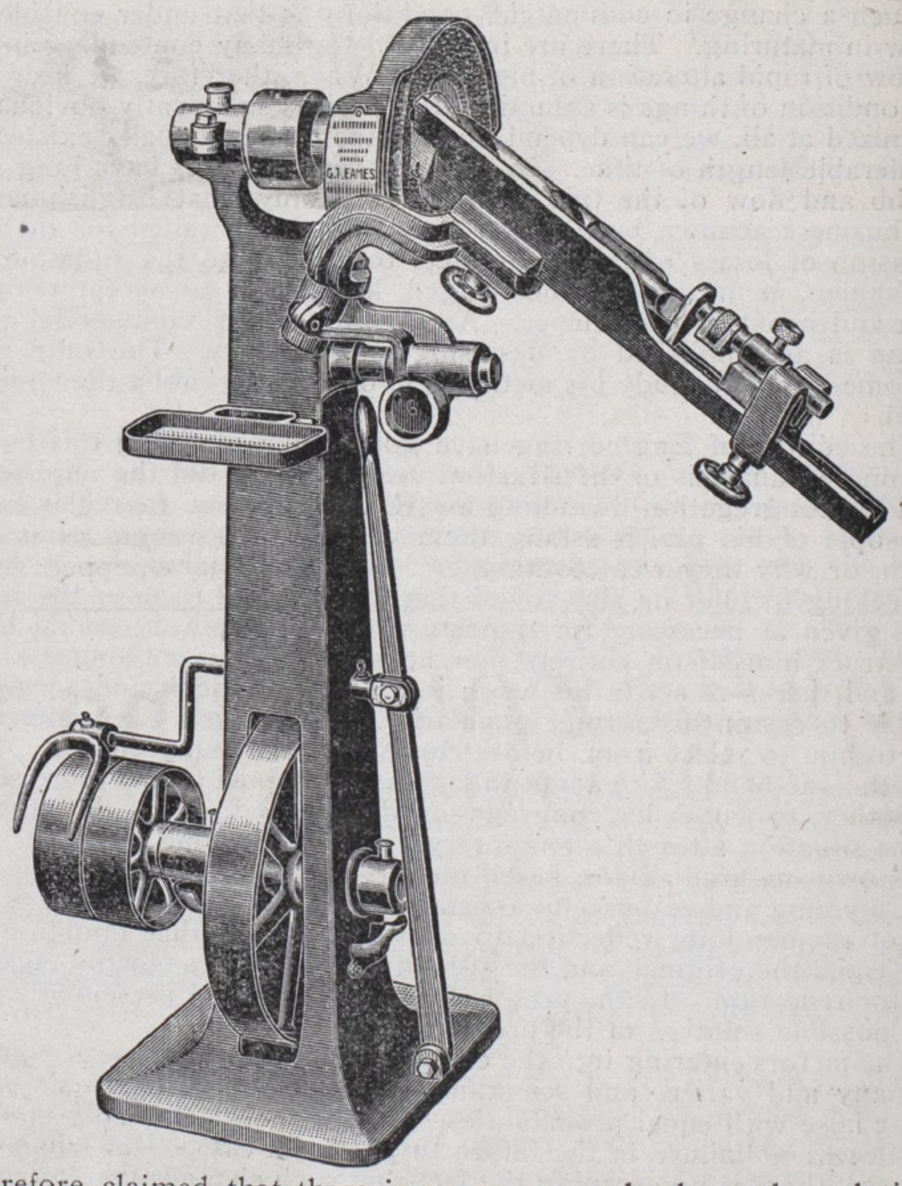
Yet the modern instruments have undoubtedly obtained accurate measurements of several miles depth. We know that the depth of the Atlantic ocean is, approximately, 4,000 feet, and that of the Pacific ocean about 13,200 feet. These are, of course, the averages. In some places there are immense depths, in others comparative shallows. The greatest efforts ever made for the exploration of these ocean basins and shallows, previous to the sailing of the Valdivia, were when the Challenger was sent out on its famous expedition by the British government, in 1872; when Dr. Nansen explored the Asian Arctic ocean and found depths of 10,000 feet and more for a long distance toward the pole; and when Lieutenant-Commander Moses, on August 10, 1896, discovered the enormous depth of 18,700 feet in Bering sea, between Bering island and Kamchatka. The officers and scientists of the Challenger expedition succeeded in obtaining, on March 24, 1873, what, until then, was the deepest sounding ever scientifically vouched for, viz., 23,250 feet, or nearly four and one-half miles. This depth was reached in the Atlantic ocean, north of St. Thomas, and remained unprecedented until September, 1889, when soundings to a depth of 46,200 feet were made in the South Atlantic ocean, midway between the island Tristan da Cunha and the mouth of the Rio de la Plata. This is the deepest sounding ever taken, but its authenticity is doubtful, although it was made with great care and in good faith. The Mediterranean also possesses some great depths. In March, 1891, during the deep-sea explorations carried on at the instance of the University of Vienna, Austria, a depth of 11,830 feet was measured between Molla and Cerigo. The greatest depth found by the Valdivia expedition, so far as known, is 18,000 feet.

The advantage gained by such researches have been very considerable. In searching the depths, minute forms of life have been discovered, and we know the causes of the ocean colors, which vary with atmospheric conditions; and our navigators, by observing them, are frequently enabled to prepare for approaching storms. We know now that the bottom of the ocean, as well as the land, is a succession of hills and valleys. Charts have been prepared of the ocean basins, and the shallower parts have been accurately mapped, with minute accounts added of their sands and beds, all of which have become aids to the mariner in determining his whereabouts by the use of a deep-sea lead. It may be said also that apart from speculations there are secrets enough in the ocean depths to forever interest the world in their exploration. From them we are obtaining, year by year, fresh forms of animal life, new chemical elements and compounds, new theories of color, light and motion. In short the depths are vast storehouses, whence may always be obtained something new to add to the already large store of human knowledge, and, rifle them as we may, they will remain inexhaustible to the end of time.—G. H. Dimpfel, Ph. D., in the Industrial Magazine.

IMPROVEMENTS IN DRILL GRINDERS.

Since the use of twist drills has become so universal, and the consumption of them so great, the necessity of grinding them mechanically correct has received very close study. The embodiment of this art in a drill grinding machine is a much deeper problem than any but specialists are aware of. In machines for this purpose gage jaws, caliper devices, chucks, or other adjusting devices have been used. The inventors of the machine illustrated herewith claim to have embodied in its design all of the lines and angles involved in the problem in such a way that every size of drill is ground theoretically correct without the necessity of the adjusting apparatus common to other machines of this class.

The holder of this new machine swings upon a journal positioned back of the grinding face of the wheel, the axial line of which journal—if extended upwardly—would pass through the body of the wheel, and intersect the apex of the "V" holder substantially at the grinding surface of the wheel. Consequently a small drill resting in the bottom of the holder would have its point near this imaginary line, and the cone upon which the cutting end of the drill is ground would be very small, as the circle that it swings on at that point would also be circumscribed. The angles of the "V" sides of the holder are formed in such relation to this axial line of oscillation that as drills increase in size they must rest further above the apex of the holder; when in position to grind their points will be thrown further ahead of this imaginary line, just in proportion to their increase in size. Therefore the lines upon which the machine itself is constructed become its own adjusting device, and automatically accomplish in this machine, it is claimed, the results obtainable in others only by the manipulation of caliper devices, gage jaws, chucks, etc. It



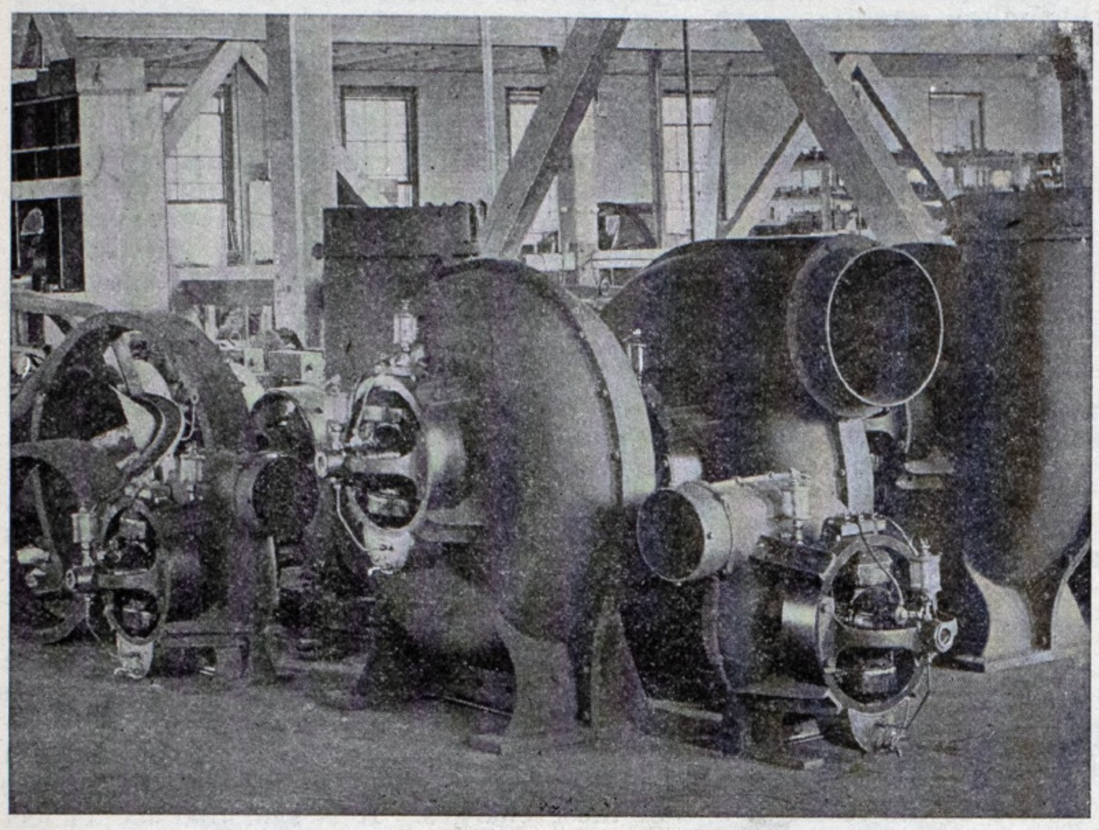
is therefore claimed that there is no guess work about the solution of this problem. It is also noted that by the proper arrangement of these lines and angles in relation to each other, drills of different sizes automatically find their places in just the proper position to be ground mechanically correct. A small drill cannot possibly occupy the space of a large one, and vice versa.

The preliminary adjustments required to set the machine to grind a drill of any size within its range are reduced to barely one, and this one only consumes a second or two of time. The operation is as follows: Drop the drill into the "V" holder, and bring up the tail-stock to suit the length of the drill; thus is the process necessarily shortened to a minimum. It would be impossible to further reduce it, as the number of adjustments can never reach less than one. It is also noted that this arrangement does away with the necessity of safety stops, or of any danger of marring the lip-rest while the machine is in use, as the holder is never moved except to follow up the wear of the wheel. Another important feature claimed for the machine is the variable clearance device. By loosening the hand wheel beneath the bottom of the holder, it may be instantly adjusted upon its curved bearing by means of a clearance screw not visible in the cut. This adjustment gives any angle of clearance to the cutting edge desired, and as may be readily understood, this same angle of clearance holds good upon every size of drill within the range of the machine (1⅛ to 2¼ inches) without resetting. This is a feature peculiar to this machine, and due to the fact that the curved seat in which the holder rests is struck from the apex of the holder itself. This machine is made by the Fuller Mfg. Co., successors to G. T. Eames Co. of Kalamazoo, Mich.

The 1900 calendar issued by the Nickel Plate road, will be mailed to anyone sending address to the general passenger agent, Cleveland, Ohio.

STURTEVANT CO.'S ELECTRICAL DEPARTMENT.

Reference has been made in these columns to the addition that was being made to the works of the B. F. Sturtevant Co., Boston, for the enlargement of operations in its electrical department. The Sturtevant company long ago established a world-wide reputation in the manufacture of blowers. Late in the seventies the demand for engine-driven fans increased to such an extent as to warrant the design and manufacture of special engines for direct attachment, and Mr. Sturtevant, who was then living, took hold of the problem with energy and developed what was in a sense a new machine. During the past ten years the constantly increasing use of electrical power has gradually led the Sturtevant



CORNER IN ERECTING DEPARTMENT, B. F. STURTEVANT WORKS.

company into the design of electric motors for fan driving. For this purpose the motor must of course be of such design as to be readily attached to and in some degree made a part of the fan which it drives. What was more, the great variety of sizes of fans, as well as speeds and powers required, demanded an excessively large line of motors of special type, which differed materially from any to be found in the market. Rapid progress has been made along this line by the Boston company, particularly during the past two or three years. This company now has an electrical department covering 20,000 square feet, equipped for the manufacture of motors and generators in sizes from 1-6 up to 125 H. P., and capable of driving fans up to 12 or 15 feet in diameter. Having already established a complete line of moderate-sized engines ranging through about the same powers, the combination of generator and engine has been simple, and the result has been a remarkably compact and durable generating set.

The illustration presented herewith is taken from a corner of the erecting department, and shows the variety of electric fan and motor work which is being done. Prominent among the late developments is the electric fan of the propeller type, the motor being entirely enclosed. By this means the trouble usually incident to the effect of dust being drawn across the motor, is entirely obviated, and the fan may be continuously operated in an out-of-the-way place, and started or stopped at any desired point. The utility of the electric fan is only beginning to be realized. Its first uses have naturally only been for the general purposes of ventilation, but it is extending so as to include the blowing of cupola, forge and boiler fires, the handling of smoke, and the general distribution of air for all purposes.

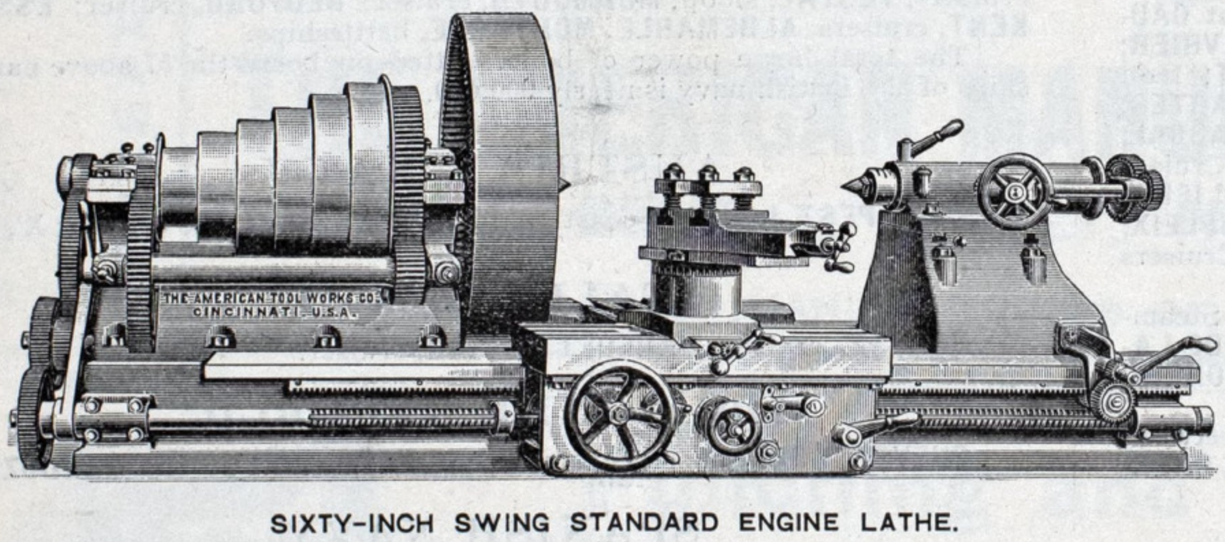
MISHAP TO THE ROYAL YACHT.

The British engineering journals appear to be experiencing the greatest difficulty in obtaining authentic details regarding the mishap which recently befell the royal yacht at the Pembroke dock yard. According to the statements of eye witnesses the yacht, which was previously resting safely on the keel blocks supported by numerous breast shores, gave three lurches immediately after she floated. The rising tide lifted her off the blocks, thus relieving her of the shores. As soon as this occurred she gave a slight list to port, then fell back slightly to starboard, hung there momentarily and again heeled to port. The starboard shores fell out while those on the port side jammed as they fell between the side of the dock and the ship's side and assisted to force the keel away from the line of blocks toward the opposite side of the dock. Ultimately the vessel steadied herself between 22½ and 25 degrees from an upright position, but the opinion is generally held that if the bow had not come in contact with the upper end of the dock, the counter being brought up on the caisson and the port bilge on the keel blocks, the ship would have continued her fall until the masts reached the roof and walls of the adjacent armor plating shop or brought up against the dock side. Despite the mishap there are many experts who predict that in the matter of sea-going trim she will prove a perfectly safe and stable vessel..

IRON WORKING MACHINE TOOLS.

We learn that Manning, Maxwell & Moore, whose principal offices are at 85, 87 & 89 Liberty street, New York, are compiling a new catalogue devoted exclusively to the illustration of iron working machine tools. Those who have new tools that they desire to have illustrated in this catalogue should immediately communicate with Manning, Maxwell & Moore at their New York office, marking their communication, "catalogue department," which will insure its receiving prompt attention.

52" AND 60" Swing Standard Engine Lathes



SIXTY-INCH SWING STANDARD ENGINE LATHE.

WE show herewith an illustration of our 52-inch and 60-inch Swing Standard Engine Lathes. These tools have all the latest improvements.

We are also builders of a complete line of high-grade tools for Machine Shop Equipment.

The American Tool Works Company,

WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway, Geo. Place, Agent.
NEW ORLEANS: The Fairbanks Co.
CHICAGO STORE: 68-70 South Canal Street.
PHILADELPHIA: The Fairbanks Co.
CLEVELAND: The Strong, Carlisle & Hammond Co.
BOSTON STORE: 36 Federal Street.
BALTIMORE: The Fairbanks Co.

SAN FRANCISCO: Henshaw, Bulkley & Co.
DENVER AND SALT LAKE CITY: The Mine & Smelter Supply Co.
LONDON: Alfred Herbert, Ltd., 7 Leonard St., Finsbury, E. C.
DUSSELDORF: de Fries & Co., Act. Ges., Graf Adolf Strasse, 83-87

ANTWERP: Nyssens Fréres, 33 Rue des Peignes.
BERLIN: de Fries & Co., Act. Ges., Kloster Strasse, 13-15.
PARIS: Roux Fréres & Cie., 54 Boulevard du Temple.
MOSCOW: Alfred Stucken.

TRADE NOTES.

Another branch office—421 Anstell building, Atlanta, Ga.—has been opened by the Magnolia Metal Co. of New York. The Magnolia company also expects to open offices in Philadelphia, St. Louis and San Francisco in the near future.

Mr. David A. Hay, representing the J. S. Johnson Co. of Baltimore, manufacturers and importers of fine fishing tackle, twines, cordage, etc., is visiting the lake trade. Fisheries of the great lakes are so extensive as to require, as a whole, a very large amount of goods in the line represented by Mr. Hay.

Nothing daintier or more artistic could well be imagined than the series of desk calendars which come as monthly souvenirs to the friends and patrons of the Bullock Electric Manufacturing Co. of Cincinnati. The latest issue is embellished by two very handsome illustrations portraying the 25 horse power type "N" Bullock motor with sub-base and the same type of motor applied to a 28 horse power engine lathe with multiple voltage control.

The Hancock Inspirator Co., manufacturing the Hancock inspirator, the Loftus automatic injector, ejectors and general jet apparatus, has moved its general office and salesrooms from Boston to 85-87-89 Liberty street, New York city. The company requests that in future all correspondence, orders and remittances be addressed to the new location, as this will insure prompt reply and greatly facilitate the quick filling of orders. The Hancock inspirator and other goods enjoy an enviable reputation among steam users generally, and are of a universally high standard.

Probably as convincing a tribute as has ever been paid to an advertising novelty is found in the fact that there is still an urgent demand for the Christmas number of the "Book of Trains," issued by the passenger department of the Lake Shore Railway Co. This little volume, which is undoubtedly the finest thing ever gotten out by the passenger department of the Lake Shore—and this is saying a great deal—is a perfect symposium of literature pertaining to the yule tide season and contains in addition original stories, pen and ink sketches and wash drawings prepared especially by writers and artists of considerable reputation. The cover design presents an especially artistic conception.

SHIP YARD AND SHIP CHANDLERY SUPPLIES.

A most complete catalogue, and one of handy arrangement as well as typographical clearness, has just been issued by the American Iron & Steel Mnfg. Co. of Lebanon, Pa. It deals mainly, of course, with merchant bar iron, bolts, nuts, washers and all kinds of rivets—material that is used very extensively by ship builders.

The American Iron & Steel Mnfg. Co. is one of the large industrial organizations that purchased in September last the works and business of the Pennsylvania Bolt & Nut Co., Lebanon Iron Co. and East Lebanon Iron Co., all of Lebanon, Pa., and J. H. Sternbergh & Son and the National Bolt, Nut & Rivet Works of Reading, Pa. These plants were among the largest and best of their kind, not merely in the United States, but anywhere in the world, with an established reputation in the field each occupied. The consolidation of these interests makes the American Iron & Steel Mnfg. Co. the largest manufacturers of bolts, nuts, rivets and kindred articles on the globe. The new company employs 4,000 men, and in the department of finished bar iron and steel alone the annual product will be about 150,000 tons. In addition to this large output of bars, the various plants make, on a large scale, all kinds of ship yard supplies, ship chandlery supplies, car forgings, steam railroad and traction forgings, railroad spikes, turnbuckles, washers, etc.

WORK OF THE YERMAK.

The most surprising achievements of ice crushing steamers in service on the great lakes seem to dwindle in comparison with the record made by the ice crusher Yermak in the two years which have elapsed since she was delivered to the Russian government by Sir W. G. Armstrong, Whitworth & Co. of Newcastle, England. This vessel has been several times described more or less extensively in the columns of the Review. A full report of her accomplishments to date is just at hand. Her maiden voyage was from Newcastle, England, to St. Petersburg, Russia, and during this journey she forced her way through 160 miles of ice. Immediately after arrival at Cronstadt a telegram was received announcing that thirteen steamers were caught in the ice near Revel. The Yermak released these vessels and then opened the way for forty steamers bound for St. Petersburg. Most interesting of all her work, however, has been the operations of the Yermak in heavy polar ice. It was found after a preliminary trial that the vessel would have to be strengthened and the forward propeller taken out and this was accordingly done. The first regular trial consumed two weeks and during this period the vessel made headway through 230 miles of ice in eighty-seven hours. So difficult is passage through the ice in the Baltic that it was necessary in many instances to move the ship astern and charge at full speed, and even with this momentum sometimes less than half the length of the ship would be gained as the result of one of these charges. It is said that ice 14 feet thick was cracked by a charge from this vessel. In charging fields of hummocky ice the Yermak's bow sometimes rose more than 9 feet.

Bids will be solicited for the construction of the Sumac, designed for service in the ninth district on the great lakes, some time in March or April. The engineer's department of the light-house board is just beginning to prepare the plans for this vessel.

BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAULT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVRAC'H**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS, SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY, AMIRAL AUBE** and **MARSEILLAISE**.

MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH, AUSTRALIEN, POLYNESIEN, ARMAND-BEHIC, VILLE-DE-LA-CIOTAT, ERNEST-SIMONS, CHILI, CORDILLERE, LAOS, INDUS, TONKIN, ANNAM, ATLANTIQUE**.

COMPAGNIE DES CHEMINS DE FER LE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS, CAEN, BREST, CHERBOURG**; Fast Steamers **TAMISE, MANCHE, FRANCE**.

RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **VETLNA**; Cruiser **DIANA**; Cruiser **PULLADA**; Torpedo Transport Boat **BAKAU**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**.

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM, ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGUE**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; **KAISER KARL VI**, cruiser; **X', X'''**, battleships.

ITALIAN NAVY.

VARESE, cruiser; **BENEDETTO BRIN**, cruiser.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA**.

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; **ALMIRATE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **GENERAL BAQUEDANO**, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship.

UNITED STATES OF AMERICA.

Northern Steamship Co.'s Passenger Steamers **NORTH WEST** and **NORTH LAND**, of 7,000 H. P. each; yachts **SHEARWATER, CORYELL, WILD DUCK, SULTANA**.

Cable Address: BELLEVILLE SAINT-DENIS, SUR-SEINE. **General Information Sent on Demand.**

The Nickel Plate road is the peoples' route and the road that gives best service at the lowest rates. A peerless trio of through express trains daily, palace sleeping cars, unexcelled dining car service, elegant equipment, these are the synonyms of the Nickel Plate's success. 8, Feb. 6

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of Jan. 31. 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	56	58¼	55¾	57½
American Steel & Wire, Pfd.....	92	92¾	92	92¼
Federal Steel	53¼	54½	53⅛	53½
Federal Steel, Pfd.....	74⅝	74¾	74¼	74¼
National Steel	44	45	44	44⅝
National Steel, Pfd.....	93½	94	93½	94
American Tin Plate	30⅜	32	30⅜	31
American Tin Plate, Pfd.....	82	.....	.....	82
American Steel Hoop.....	44	45½	44	44¼
American Steel Hoop, Pfd.....	82	82	81½	81½
Republic Iron & Steel	22¾	24	22½	23½
Republic Iron & Steel, Pfd	67½	67½	67	67

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., January 29, 1900. Sealed proposals for Extension and Repair of Piers at Manistee, Mich., will be received here until 3 p. m., February 28, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. Feb. 22.

SEALED PROPOSALS will be received at the office of the Light-house until 2 o'clock p. m., March 1, 1900, and then opened for furnishing the materials and labor of all kinds necessary for the construction and delivery of the steam wooden light-vessel, No. 74, delivered at the Buoy Depot, at Little Diamond Island, Portland Harbor, Maine, in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to this office. F. J. Higginson, Rear Admiral, U. S. N., Chairman. Feb. 8.

CAPT. GEO. A. SIMPSON, Expert Compass Adjuster,
19 YEARS EXPERIENCE.
Yearly Contracts Solicited. Nautical Instruments Repaired.
OLD 'PHONE No 319. SAULT STE. MARIE, MICH.

A MODEL OF SIMPLICITY!
PNEUMATIC TOOLS FOR ALL KINDS OF WORK
CC Co.
CHICAGO - NEW YORK

A SPECIALTY: TOWING LINES AND SHIPS' HAWSERS

ROPE

THE AMERICAN MANUFACTURING CO.
65 WALL STREET, NEW YORK.
THE LARGEST MANUFACTURERS OF FIBER IN THE WORLD.

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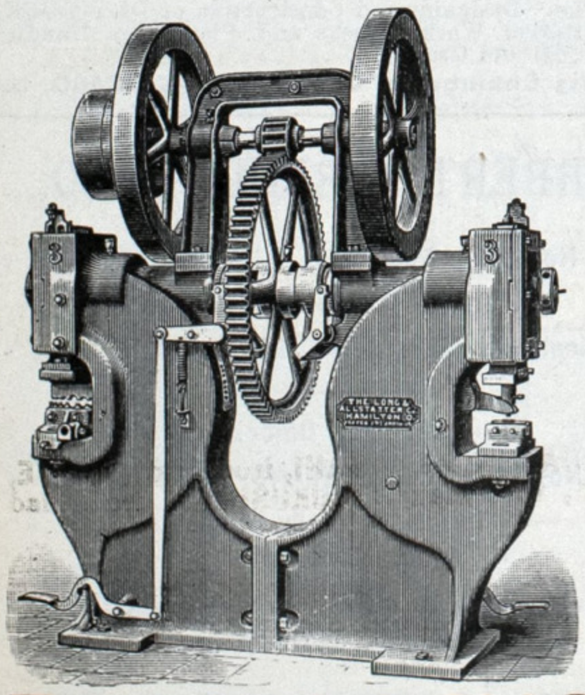
4-STRAND PLUMB CO HEART HOISTING ROPE FOR CARGO FALLS

Punching and Shearing Machinery...



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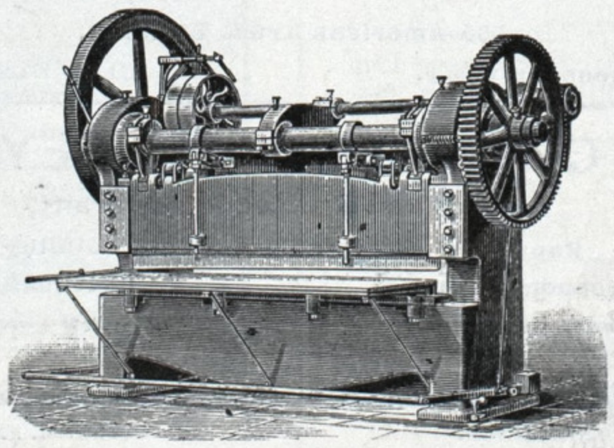

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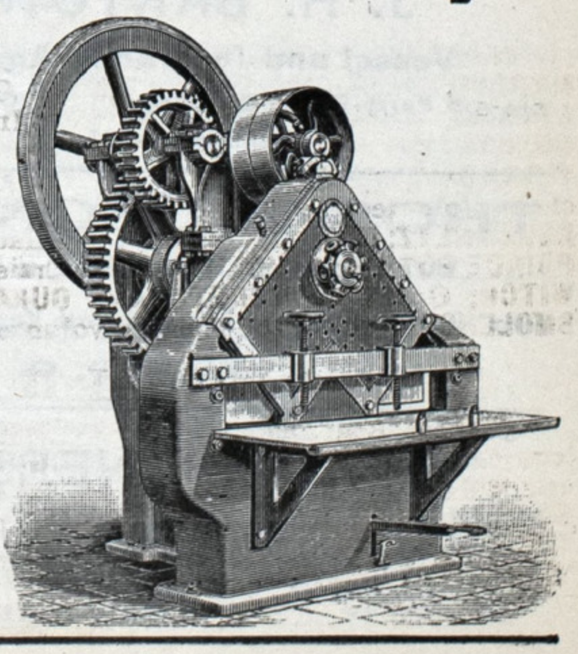

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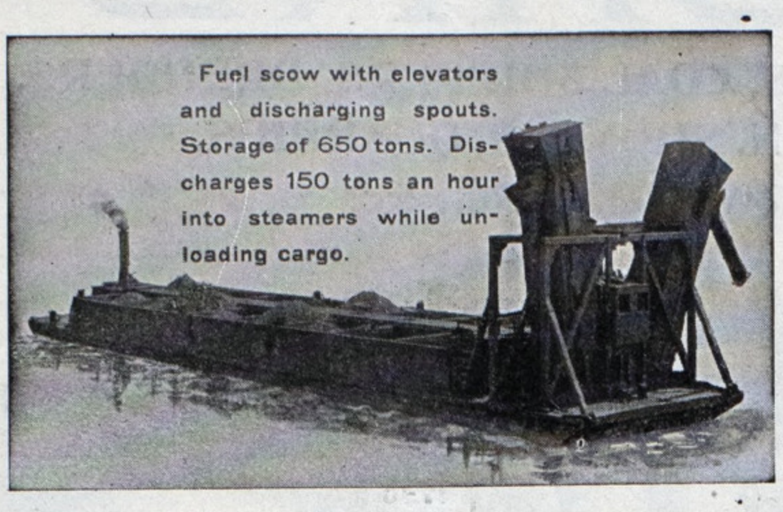
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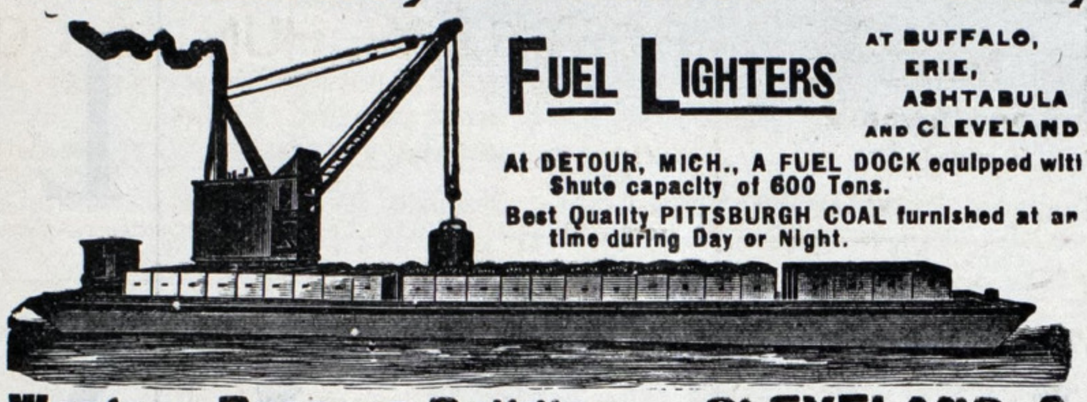

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U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., January 24, 1900. Sealed proposals for Extension and Repair of Piers at White Lake, Mich., will be received here until 3 p. m., February 23, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. Feb. 15.

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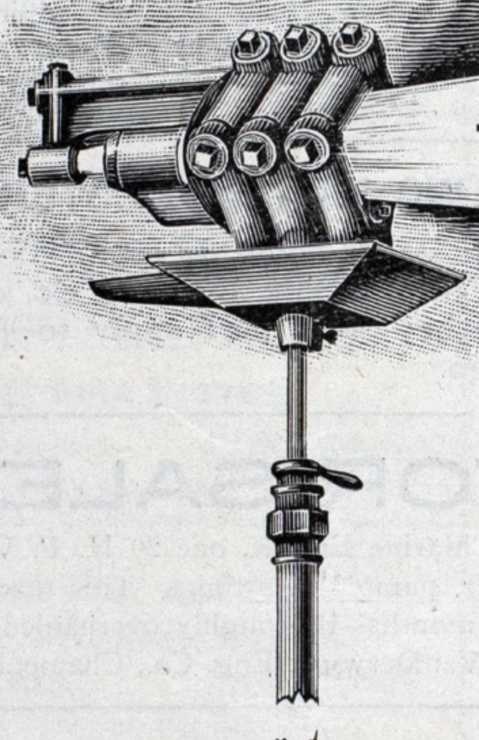

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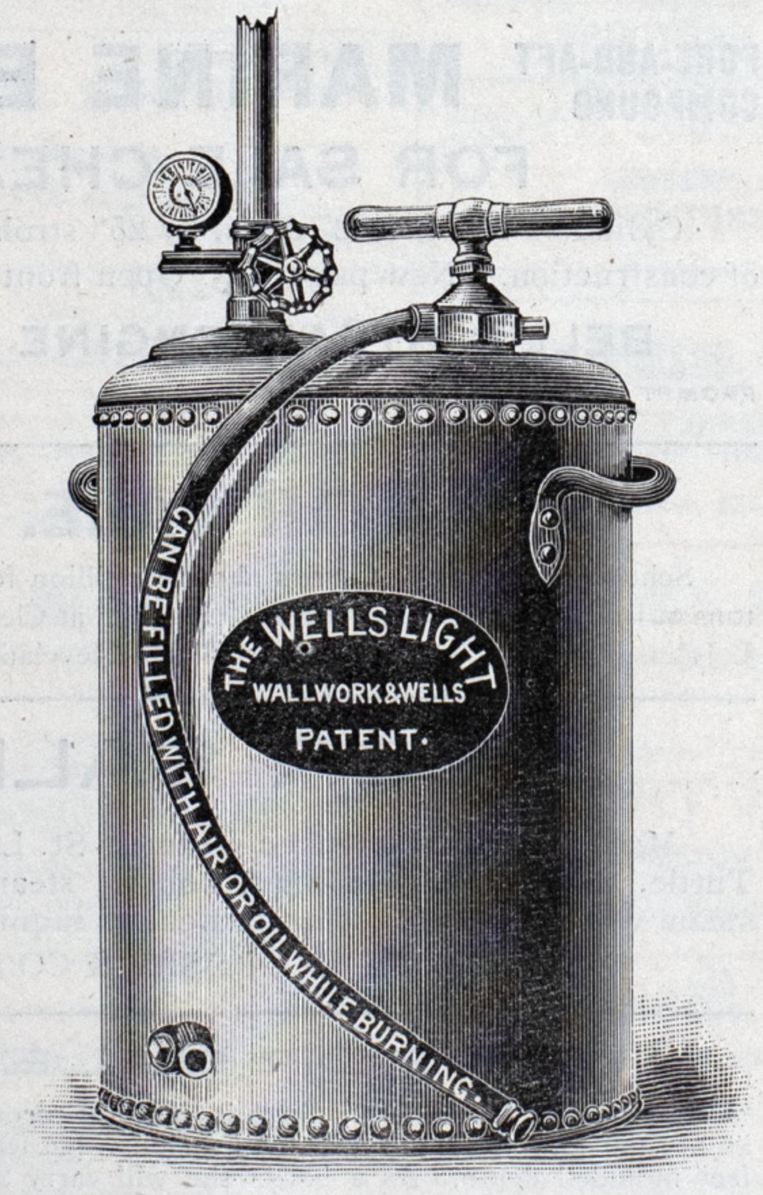

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